



Agenda Item 4: Review of Project H4 – OPMET Exchange

OPMET exchange in IWXXM format

(Presented by the Secretariat)

SUMMARY	
This working paper presents the status of planning of OPMET exchange in IWXXM GML format.	
References:	
<ul style="list-style-type: none">• Annex 3- <i>Meteorological Service for International Air Navigation</i>• Report of the Second meeting on MET Projects, Lima, 18-22 September 2017• Report of the COM/MET meeting, Lima, Peru, 22-25 May 2019• Report of the ICAO MET Panel meeting• Report of the Twenty-third meeting/workshop of the SAM Implementation Group (SAM/IG/23)	
ICAO strategic objectives:	<i>A - Safety</i> <i>B – Air navigation capacity and efficiency</i> <i>E – Environmental protection</i>

1. Introduction

1.1 Amendment 78 to ICAO Annex 3 introduced the standard on OPMET data exchange in IWXXM format.

1.2 The MP/2 meeting analysed the inclusion of OPMET exchange in IWXXM format in Project H4.

1.3 The Fourth meeting of the MET Panel recommended that the Secretariat be requested to circulate IWXXM guidelines among the regional planning and implementation groups (PIRGs).

1.4 The COM/MET/2019 meeting reviewed the status of implementation of IWXXM in SAM States.

1.5 The SAM/IG/23 meeting reviewed this issue, since it involved the CNS and MET areas, and issued a conclusion in this regard.

1.6 The MP/2 meeting had reviewed the exchange of OPMET data in the CAR/SAM Regions.

2. Discussion

2.1 Amendment 78 to ICAO Annex 3 was approved on 7 March 2018, effective 16 July 2018, and introduced, *inter alia*, IWXXM, as the format for all OPMET messages.

2.2 Regarding IWXXM, Amendment 78 stated the following:

- Until 4 November 2020, transmission in IWXXM GML of all advisory messages (volcanic ash, tropical cyclones, space weather) and OPMET messages (METAR, SPECI, TAF, SIGMET, AIRMET) is a recommendation
- Starting 5 November 2020, transmission in IWXXM GML becomes a standard.

2.3 Regarding space weather advisory messages, the recommendation is as of 7 November 2019.

2.4 The fourth meeting of the MET Panel (METP/4) formulated Recommendation 5/10, which, in part b) invited the Secretariat to circulate IWXXM guidelines to the regional planning and implementation groups (PIRGs). More recently, the MIE/5 meeting (Montreal, 6-10 May 2019) reviewed the IWXXM guidelines and approved a series of updates to support future MET-related workshops and meetings as well as IWXXM implementation.

2.5 In this regard, the METP/5 meeting (final report still in draft version) approved Version 3 of the Guidelines for the Implementation of OPMET data exchange using IWXXM, and also requested the ICAO Secretariat to distribute it to the regional planning and implementation groups (PIRGs). The version is contained in **Appendix A** to this working paper (available only in English).

2.6 The MP/2 meeting reviewed the table of activities under Project H4 and made some updates, which are shown in **Appendix B** to this working paper. In this regard, since Mr. Alexander Quintero is no longer part of SERMETAVIA of Venezuela, it was decided to appoint Mr. Reidy Zambrano of project coordinator. Furthermore, pursuant to the recommendation of the *ad hoc* group established to review item 5, it was also decided to include the IWXXM Implementation Plan in the activities of the project, reason why it is also scheduled for completion in December 2020.

2.7 In order to prepare communication systems for OPMET exchange in IWXXM GML format, the COM/MET/2019 meeting studied the need to adapt AMHS terminals of meteorology users for transmission and reception of AMHS messages with content (meteorological information) in the new IWXXM format. Meteorological information will be sent as an attachment to the AMHS message. **Appendix C** to this working paper presents an example of METAR coded in the new IWXXM format, and **Appendix D** contains the operational concept (CONOPS) for the transition to OPMET data exchange using IWXXM.

2.8 According to the analysis conducted by this meeting, there are two possibilities of adapting a meteorological user (human) terminal. One possibility is to obtain a new version from the AMHS user terminal provider that can be adapted to transmit and receive messages with IWXXM content through a human-machine interface (HMI) that creates an attachment with the OPMET information in IWXXM format and transmits in an AMHS message.

2.9 Another possibility is to have an application (software) that codes OPMET information in the IWXXM format, generating an XML file that may be sent as an attachment to an AMHS message.

2.10 The COM/MET/2019 meeting took note that the Brasilia regional OPMET bank had been adapted to receive and store meteorological information in the IWXXM format, version 2.1, and send

available information via AMHS as an attachment to an AMHS message. There is a specific AMHS address of the Brasilia OPMET bank for receiving/transmitting in IWXXM format, namely:

C=XX; A=ICAO; P=SB; O=SBBR; OU1=SBBR; CN=SBBRWXXM

However, the Brasilia regional OPMET bank continues to receive and transmit OPMET information in TAC format through the usual AMHS address (C=XX; A=ICAO; P=SB; O=SBBR; OU1=SBBR; CN=SBBRYZYX).

2.11 The Secretariat of the meeting noted that the last meeting of the SAM Implementation Group (SAM/IG/22, Lima-Peru, 19-23 November 2018) had created the Interoperability Task Force (GT Interop), with the possibility of creating a subgroup to address the interoperability of existing systems for preparing, transmitting and receiving messages in IWXXM format in the Region. The Secretariat will present a paper at the SAM/IG/23 meeting to suggest the creation of the MET IWXXM subgroup under the GT Interop.

2.12 Upon analysing the implementation of the IWXXM GML, the SAM/IG/23 meeting formulated Conclusion SAM/IG/23-03, as shown below:

2.13

CONCLUSION SAM/IG/23-03 Adaptation of AMHS terminals of aeronautical meteorology users	
<p>That: Pursuant to the standard requiring the implementation of the exchange of OPMET messages in IWXXM GML format by 5 November 2020, States should:</p> <p>a). Adjust AMHS terminals of aeronautical meteorology users so that they may transmit and receive OPMET messages in IWXXM GML format</p> <p>b). Implement the necessary AMHS interconnections in order to facilitate the transmission and reception of OPMET messages in IWXXM GML format</p> <p>c). States in a position to do so should conduct OPMET message exchange trials in IWXXM GML format</p>	<p>Expected impact:</p> <p><input type="checkbox"/> Political / Global</p> <p><input type="checkbox"/> Interregional</p> <p><input checked="" type="checkbox"/> Economic</p> <p><input type="checkbox"/> Environmental</p> <p><input checked="" type="checkbox"/> Technical/Operational</p>
Why: To meet the provisions of Amendment 78 to ICAO Annex 3	
When: Immediately	Status: Adopted by SAM/IG/23
Who: <input type="checkbox"/> Coordinators <input checked="" type="checkbox"/> States <input type="checkbox"/> ICAO Secretariat <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: Users/industry	

2.14 MET services may invoke this conclusion to request the adaptation of their AMHS terminals for OPMET exchange in IWXXM GML format before 5 November 2020.

3. **Suggested action**

3.1. The Meeting is invited to:

- a) take note of the information provided in this working paper;
- b) review the information provided in Appendices A, B, C and D; and
- c) consider other actions it may deem appropriate

INTERNATIONAL CIVIL AVIATION ORGANIZATION



**GUIDELINES FOR THE IMPLEMENTATION OF
OPMET DATA EXCHANGE USING IWXXM**

DRAFT THIRD EDITION – MAY 2019

TABLE of CONTENTS

TABLE of CONTENTS	3
TABLE of FIGURES	5
1 Introduction	6
1.1 Purpose.....	6
1.2 Background.....	6
1.3 Intended Audience	6
2 Current Operations and Capabilities	7
2.1 Current Capabilities	7
2.2 Data Producer/Originating Unit	7
2.3 Data Aggregator	7
2.4 Data Switch	7
2.5 National OPMET Centre (NOC).....	7
2.6 Regional OPMET Centre (ROC)	7
2.7 Interregional OPMET Gateway (IROG)	8
2.8 International OPMET Databank.....	8
3 Inclusion of IWXXM within ICAO Annex 3	9
4 Proposed service concept	10
4.1 Operating principles.....	10
4.1.1 Managing the transition.....	10
4.1.2 Variances to the IWXXM Model	10
4.1.3 Translation.....	10
4.1.4 Data collection	11
4.1.5 Transmission & Routing	11
4.1.6 Compliance Testing	11
4.1.7 International OPMET Databank	11
4.1.8 Aeronautical Information Metadata	12
5 Functional requirements - Framework	13
5.1 Functional definitions.....	13
5.1.1 Data Producer/Originating Unit	13
5.1.2 Data Aggregator.....	14
5.1.3 Data Translation Centre.....	14
5.1.4 Data Switch.....	15
5.1.5 International OPMET Databank	16
5.2 Regional Centres Definitions	18
5.2.1 National OPMET Centre (NOC)	18
5.2.2 Regional OPMET Centre (ROC)	18
5.2.3 Interregional OPMET Gateway (IROG).....	19
5.2.4 International OPMET Databank	19
6 Generation and use of IWXXM	20

6.1	Operational Status Indicator (PermissibleUsage)	20
6.1.1	Definition of Operational and Non-Operational messages	20
6.1.2	Technical Detail on the Operational Status Indicator	21
6.2	Unique GML.ID	22
6.3	Translating TAC to IWXXM	22
6.3.1	Pre-requisites for Translation Centres	22
6.3.2	Data Validation	22
6.3.3	Incomplete (Partial) Translation	23
6.3.4	Monitoring Functions	24
6.3.5	Validation of the Translator	24
6.3.6	Commencement of Translation Services	24
6.3.7	Translation Agreement	24
7	Requirements to Transition	26
7.1	Phase 1: Pre-Requisites to Transition	26
7.1.1	Managing the Transition	26
7.1.2	Documentation	26
7.1.3	Processes	26
7.2	Phase 2: From Nov 2016 until IWXXM Exchange is a Standard	27
7.2.1	Operations	27
7.2.2	Processes	28
7.3	Phase 3: After IWXXM Exchange becomes a Standard	29
8	Data Validation and Statistics	30
8.1	IWXXM Validation Statistics to be Gathered by ROCs an RODBs	30
8.1.1	Data and Type of Data	30
8.1.2	Proposed Statistics	30
8.1.3	Statistics Presentation	32
8.2	IWXXM Validation Statistics to be Gathered by SADIS & WIFS	32
9	Acronyms and Terminology	33
	Appendix A: AMHS Profile Information to Support IWXXM Exchange	35
	Appendix B: Sample Tests for NOCs to Conduct when Introducing IWXXM	42

TABLE of FIGURES

Figure 1: Comparison of IWXXM and TAC Producers	13
Figure 2: Data aggregation.....	14
Figure 3: Data Translator generating IWXXM from TAC.....	15
Figure 4: Aggregation of TAC and IWXXM data.....	16
Figure 5: The implementation of a combined TAC & IWXXM Databank	17
Figure 6: Phase 2, interregional exchange of OPMET with Region 2 (IWXXM & TAC capable) and Region 3 (TAC capable).....	29

1 Introduction

1.1 Purpose

The main intention of this document is to describe the activities relating to the transition of intra- and interregional operational meteorological (OPMET) data exchange until 2020 and operational exchange beyond. During this period, the amendments to ICAO Annex 3, *Meteorological Service for International Air Navigation*, requiring this transition towards digital data exchange will become applicable for the international exchange of OPMET data.

1.2 Background

The bilateral exchange of IWXXM (ICAO Meteorological Information Exchange Model) based information was introduced in November 2013 through Amendment 76 to ICAO Annex 3, enabling States to exchange their OPMET data not only in TAC (Traditional Alphanumeric Code form) but also in extensible mark-up language (XML) and more precisely geography mark-up language (GML).

This represented the start of a significant change from the provision and exchange of textual OPMET data towards a digital environment supporting the ICAO Global Air Navigation Plan (GANP) and transition towards a SWIM (System Wide Information Management) environment.

Since their inception, OPMET data has been promulgated systems with the data products initially designed to be human readable. Due to bandwidth limitations, these products are highly compact to facilitate a regular and efficient flow of data.

The exchange of IWXXM information became a recommendation through Amendment 77 to ICAO Annex 3 from November 2016, with some States exchanging digital products (IWXXM) from early 2017. The exchange of IWXXM will be a standard from November 2020, as indicated in Amendment 78 to ICAO Annex 3.

The use of OPMET in a TAC format presents an obstacle to the digital use of the data as it often contains typographical errors, is poorly structured and lacks validation. This makes the handling of global data difficult to use correctly and expensive to maintain. These significant difficulties have been highlighted during past code changes. The coding practices in text form also presents an obstacle to efficient automation as State coding exceptions are commonly used.

IWXXM represents the first step to move to an environment where the systems handling this data can make more use of standard applications and techniques. The development of new systems which provide and support digital OPMET requires initial investment but the use of enabling data exchange standards for other domains such as AIXM (Aeronautical Information Exchange Model) and FIXM (Flight Information eXchange Model) along with IWXXM will lead to a cost reduction due to the implementation of widely used data modelling techniques including OGC (Open Geospatial Consortium) segments. Consequently, users are presented with opportunities to create new products at a lower cost by fusing this data.

It is essential that the transition towards the use of IWXXM is adequately planned and equipped to make reliable data sets available to users for exploitation as soon as possible at both a Regional and a Global scale. This guidance document provides elements and steps for consideration in achieving that aim by defining common definitions and concepts, as well as structured phases to be implemented in relation to the International exchange of OPMET data.

1.3 Intended Audience

This document is intended to be used by Centres considering being involved in the exchange of IWXXM data, both within a region and inter-regionally.

2 Current Operations and Capabilities

2.1 Current Capabilities

The current capabilities are dedicated to Traditional Alphanumeric Code (TAC) data exchange, via the Aeronautical Fixed Service (AFS), primarily the aeronautical fixed telecommunications network through AFTN and AMHS protocols, SADIS and WIFS.

AMHS provides a mechanism for the exchange of IWXXM information as attachments by utilising the AMHS File Transfer Body Part (FTBP) feature over the AFS.

2.2 Data Producer/Originating Unit

The TAC Data Producer provides TAC data only.

2.3 Data Aggregator

The function of the Data Aggregator is to take individual TAC reports, perform limited data validation and aggregate them into bulletins. Bulletins shall consist of one or more reports of the same type (e.g. METAR).

2.4 Data Switch

A Data Switch will route the data according to the WMO abbreviated header structure, TTAiiCCCC, of the bulletin. The bulletin header fulfils the regulations described in WMO doc No 386, *Manual on the Global Telecommunication System*.

2.5 National OPMET Centre (NOC)

The role of the NOC is to gather and validate all - international required OPMET messages – required AOP and agreed exchanged non-AOP - (refer to the Regional (electronic) Air Navigation Plans for AOP) generated by all originating units within a State, to compile national data into bulletins and to distribute them internationally according to the regional distribution schema.

A NOC should perform the following functions:

- Data Aggregator;
- Data Validator; and
- Data Switch.

2.6 Regional OPMET Centre (ROC)

A ROC is responsible for the collection from NOCs and validation of all required AOP and agreed exchanged non-AOP OPMET data in its area of responsibility (AoR) according to the regional distribution schema.

Each ROC is responsible for the collection of all required OPMET data and agreed exchanged non-AOP OPMET data from the other ROCs in the region and the dissemination to the other ROCs of these data from its AoR.

A ROC should perform the following functions:

- Data Aggregator; and
 - Data Switch.
-

2.7 Interregional OPMET Gateway (IROG)

An IROG is responsible for the collection of all required OPMET data and agreed exchanged non-AOP OPMET data from its interregional area(s) of responsibility (IAoR) and its dissemination to the ROCs in its region.

Furthermore, the IROGs are responsible for collection and dissemination of their region's required AOP and agreed non-AOP exchanged OPMET data to their partner IROGs.

The IROG is responsible for the validation of the bulletins sent to the IROGs of its IAoR and received from their IAoR.

For TAC data exchange, an IROG should perform the following functions:

- Data Aggregator; and
- Data Switch.

2.8 International OPMET Databank

An International OPMET Databank provides the capability for users to interrogate TAC data through the AFTN or AMHS. In some regions the databank is known as a Regional OPMET Databank (RODB).

Operational principles:

- OPMET Databank Requests

- Requests for TAC data can be sent via the AFS using AFTN or AMHS. These requests work as described in current Regional OPMET Data Bank (RODB) Interface Control Documents (ICD).
- The above example describes the syntax of TAC requests:
 - "RQM/" is used as the start of the query
 - only the new T₁T₂ message types defined by the World Meteorological Organization (WMO) are allowedFor example: RQM/SALOWW/WSEBBR/WSLFFF=
 - the request is sent to the AFTN address of the International Databank

- OPMET Databank Replies

- Replies to TAC requests are described in the current RODB Interface Control Documents.
- Reply reports of a request will be aggregated into one or more messages, according to the same rules used by the Data Aggregators, e.g. no mixing of message types in one file.
- The RODB Interface Control Documents should specify a set of standardized information & error replies, specifically when the required data are not defined (example: request for a SIGMET with a wrong location indicator)

3 Inclusion of IWXXM within ICAO Annex 3

ICAO Annex 3 defines what IWXXM capability is required at different time frames. These capabilities can also be considered in context of the ICAO SWIM-concept (Doc 10039, *Manual on System Wide Information Management (SWIM) Concept*).

The Amendment 78 to Annex 3 introduced the requirement for the international exchange of the METAR/SPECI, TAF, AIRMET, SIGMET, VAA and TCA XML-formatted messages as a standard with effect from November 2020. In addition, Space Weather Advisories in XML format are a recommended practice and a standard from 2019 and 2020, respectively.

Note: The intention of this Guidelines document is not to define Net Centric services but to provide guidance as a stepping stone for a swift transition to IWXXM implementation as a first step towards SWIM.

4 Proposed service concept

4.1 Operating principles

This section outlines the general principles for transitioning the international exchange of OPMET data. These principles are still based on continued use of the WMO abbreviated header structure and all participating States using the ICAO Extended AMHS. The intention is to support the different identified phases that will lead to a managed IWXXM-based international exchange of METAR/SPECI, TAF, TCA, VAA, AIRMET and SIGMET, Space Weather data by the Amendment 78 to Annex 3 applicability date.

4.1.1 Managing the transition

A group responsible for managing the transition should be identified in each region, for the necessary intraregional and interregional coordination and should be guided by METP WG-MIE with the support of WMO.

It is assumed that different regions will progress at different rates. It is necessary to create a plan that facilitates this different implementation pace.

The Meteorological Panel (METP) Working Group on Meteorological Information Exchange (WG-MIE) has developed this Guidelines document to assist all ICAO regions with the transition to IWXXM exchange. Each ICAO region may also establish a regional version of the document to provide regional information and references but it is important that this should maintain alignment to the global guidelines to ensure the inter-regional exchange is not affected. To simplify management of both the global and regional documentation, regions are encouraged to only modify or add appendices.

One example of regional information would be tests for National OPMET Centres for exchanging IWXXM via the Aeronautical Fixed Service using AMHS with FTBP and AMHS profile for IWXXM data, as indicated as guidance in the Appendix A and Appendix B of this document.

It would be recommended that this regional information be contained in an appendix to the main document, whereby it could be reviewed and agreed, in particular in those regions who have not yet established such regional information.

Note: Groups such as Data Management Group for EUR, the Bulletin Management Group for MID and the Meteorological Information Exchange working group (MET/IE) for APAC could be the right groups to manage this transition (or equivalent groups in other regions). Where AMHS is being used, close cooperation with the State COM Centre is advised to assure an efficient management of AMHS links and interconnections between adjacent regions.

4.1.2 Variances to the IWXXM Model

National extensions (such as remark sections) could only be supported when accompanied by necessary XML tags and in a globally agreed standard way. The international exchange of these extensions will only be supported for data fully compliant to the IWXXM model and abuse of extensions must be prevented.

Note: The term "IWXXM model" should be understood as the XML schema including all necessary GML components (including metadata) necessary for the exchange of IWXXM data. The use of extensions within the IWXXM is discouraged and should only be utilised where absolutely necessary.

4.1.3 Translation

A State will be required to produce IWXXM data **in addition** to TAC data for international exchange from November 2020. Generating both formats will help minimize, as much as possible, the translation between formats. It will also avoid operational translation/conversion from IWXXM to TAC and onward forwarding, as the bi-directional conversion will not necessarily result in the same TAC.

Where a translation from TAC to IWXXM is necessary and conducted, the translation centre and date/time of when the translation occurred will be identified within the XML message (refer to section 6.3).

4.1.4 Data collection

When creating a feature collection of the same type of IWXXM data (e.g. METAR), further named as “bulletin”, the aggregating centre identifier and date/time group of when the collection was created will be indicated within the XML message. The aggregating centre metadata will be defined as part of a globally accepted GML/XML model.

Only regular reports (e.g. METAR and TAF) will be aggregated. Non-regular reports (e.g. SIGMET, SPECI, AIRMET and VAA) will NOT be aggregated.

A single bulletin will only contain TAC or XML, never both.

A single file will contain only one bulletin.

4.1.5 Transmission & Routing

Given the size and character set of IWXXM messages, it will not be possible for these messages to be transmitted via AFTN. The file containing the bulletin will be compressed and FTBP (**File Transfer Body Part**) under Extended AMHS (**ATS Message Handling System**) will be used to exchange IWXXM data internationally through the AFS.

The principles of exchanging IWXXM data on AMHS are further described in section 5.1.4 but, in general, rules close to the ones governing the TAC transmission are applied.

The WMO abbreviated header structure (TTAAiCCCC) is part of the filename of the FTBP and used as data identifier. The routing of IWXXM messages should associate this data identifier with AMHS address(es) that the message should be sent to.

As a file name extension, the gzip (.gz) suffix will be used to identify a compressed file containing meteorological data.

Note: The number of FTBPs and the maximum message size are subject to the AMHS specifications and recipients User Capabilities. It would be highly desirable to have a common agreed maximum limit size for AMHS messages between all ICAO regions. A total size of AMHS message (including FTBP) up to 4MB should be considered, as already defined in some regions. The available network path between the Originator and Recipient must be completely AMHS with FTBP support for successful message delivery. It does not necessarily require each COM Centre in the path to operate AMHS in Extended Services to relay an AMHS message with FTBP. To ensure that delivery is within the capabilities of the recipient, it is advised that the User Capabilities are coordinated before the establishment of regular communications. In some regions, this information may be available through Directory Services (X.500/EDS). The available bandwidth for each ‘hop’ in the network should be considered by COM Centres when switching to AMHS FTBP operations.

4.1.6 Compliance Testing

IWXXM compliance testing platforms or software will be made available in order to allow States to test the compliance of their XML data to the IWXXM model before operational international exchange. This is to assure that the future internationally disseminated data are operationally usable.

4.1.7 International OPMET Databank

In order to allow IWXXM data retrieval from International OPMET Databanks, a standard set of queries for IWXXM data will also need to be developed, agreed and documented. An Interface Control Document will be provided to describe the query structure, structure of the answer(s) and bulletin header(s) to be used by the International Databank, as well as all other information necessary for the automatic use of the query answers. The initial interface for ad hoc requests for IWXXM data will follow similar rules as the TAC-requests (refer to section 5.1.5). It is expected that the range of queries and the method of access will become more extensive as we migrate into a SWIM environment.

4.1.8 Aeronautical Information Metadata

The aeronautical information metadata are part of the XML model and should be transported by the IWXXM data by means of an external reference to AIXM.

The metadata is additional information relevant to the type of the aeronautical information object i.e. an airport, a flight information region (FIR). A challenge resides in getting the correct state of this aeronautical information, especially for centres that will perform translation from TAC to XML that will require this. Therefore, obtaining this from an authorized source (details to be determined) is implied, in order to provide the right piece of information that characterizes the data.

The access to aeronautical metadata should be provided by a link to the AIXM model, therefore avoiding possible inconsistencies between the transported metadata inside the IWXXM data and the current status of this aeronautical information as part of the AIXM model.

5 Functional requirements - Framework

This section is intended to describe the generalized elements which can be used to establish a framework for the exchange of IWXXM data, both intraregional and inter-regionally. One key aspect is that the framework needs to be flexible to permit development of an intra-regional structure suitable to the requirements, but at the same time allowing establishment of controlled and coordinated exchange between Regions.

The framework is organized into a basic set of functions/type of operations as described in section 5.1. A list of requirements that should be met to carry out each respective function as well as illustrations on how these functions may be performed/combined are provided in the same section.

In section 5.2, more complex regional entities which comprise some of the above functions are described.

5.1 Functional definitions

5.1.1 Data Producer/Originating Unit

TAC Producer

This producer provides TAC data only.

IWXXM Producer

This producer provides IWXXM. The IWXXM Producer may provide information in both TAC (until no longer required in Annex 3) and IWXXM forms.

The Data Producer-function may be performed by an aeronautical meteorological station (e.g. producing a METAR), a MWO producing AIRMET or SIGMETS or by an Aerodrome Meteorological Office (AMO) providing TAFs.

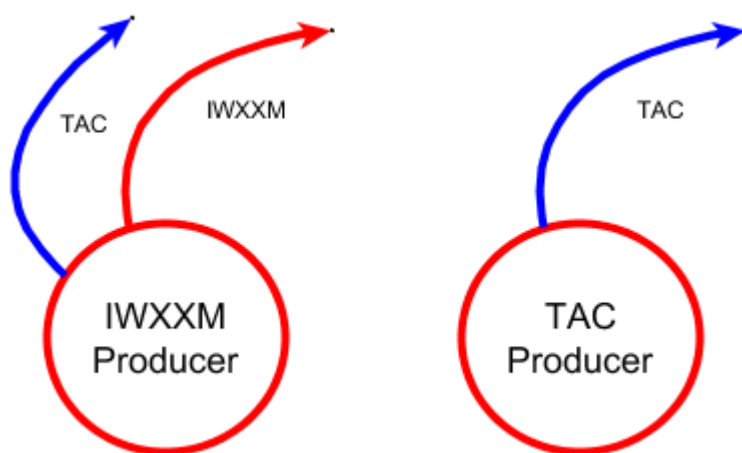


Figure 1: Comparison of IWXXM and TAC Producers

For an IWXXM Producer, the following functions could be the subject to compliance testing:

- The Producer output will conform to the IWXXM Schema;
 - The Producer output will pass IWXXM Schematron/business rules; and
 - The Producer will apply appropriate (defined) metadata following agreed ICAO rules and regulations.
-

5.1.2 Data Aggregator

This function takes individual IWXXM reports - decompresses them if already compressed – aggregates them (when multiple METAR or TAF reports), applies the Feature Collection Model and then compresses the file containing the resulting information. The aggregation shall consist of one or more reports of the same type (e.g. METAR, SIGMET).

The 'Feature Collection Model' (COLLECT) is currently used to represent a collection of one or more GML feature instances of the same type of meteorological information. The intent is to allow XML encoded meteorological information to be packaged in a way that emulates the existing data distribution practices used within Aeronautical Fixed System (AFS).

Note: The collection of meteorological information is often referred to as a bulletin.

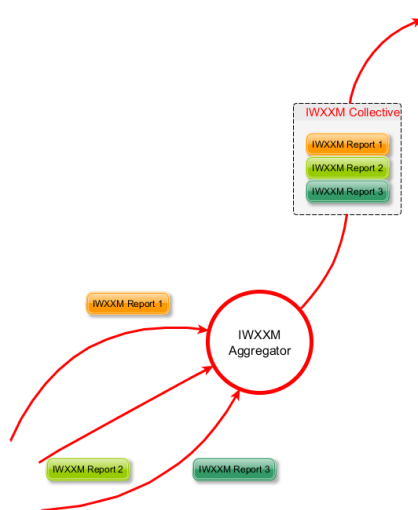


Figure 2: Data aggregation

For an IWXXM Aggregator, the following functions could be the subject of compliance testing.

- The Aggregator output will conform to the IWXXM Schema;
- The Aggregator output will pass IWXXM Schematron/business rules;
- The Aggregator will apply a correct filename to its output;
- The Aggregator correctly compresses data applying an appropriate suffix; and
- The Aggregator will apply appropriate (defined) metadata following agreed ICAO rules e.g. for monitoring and validation issues.

5.1.3 Data Translation Centre

A data translator converts TAC data into IWXXM on behalf of their State and/or another State (i.e. when the data producer is unable to do so). A bi-lateral or regional agreement should be defined for such circumstances. To do so, it shall be able to parse incoming TACs and apply the data to IWXXM schema. It is expected that this will be carried out on a bulletin basis so that the translator will always be associated with a Data Aggregator function.

It is highly likely that not all incoming TACs will be translatable due to of non-conformance with TAC standards. There will be a need to have procedures in place to deal with any non-compliant data, which may involve further translation where predefined arrangements have been made. Refer to section 6.3 for more details.

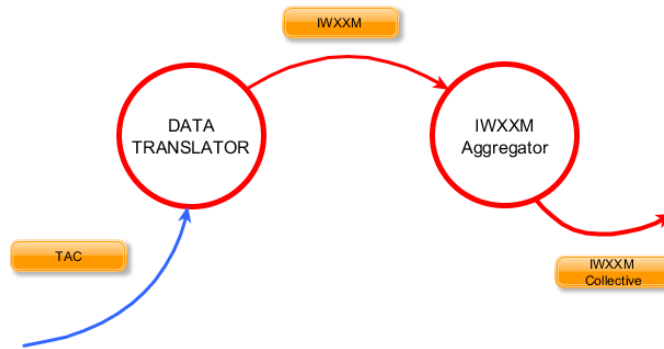


Figure 3: Data Translator generating IWXXM from TAC

Note: A Translation centre should also perform Data Aggregator functions. Whilst the IWXXM Schema may be extended for national translation purposes, an emphasis on maintaining the purity of the schema should be maintained. Where extensions to the schema are proposed to be disseminated internationally, these should follow the WMO extension mechanism for extending the schema and the extensions should be standardised where possible with other States, so that the benefits of the extensions use can be realised by all ICAO members.

5.1.4 Data Switch

A Data Switch will route IWXXM data according to the TTAAiiCCCC part of the filename of the File Transfer Body Part. The filename including the current WMO bulletin header will be structured as follows (WMO naming convention A):

A_TTAAiiCCCCYYGGgg**BBB**_C_CCCC_YYYYMMddhmmss.xml.gz

Where the elements in black and bold are fixed elements and:

TTAAiiCCCCYYGGgg is the current WMO header with the date time group

BBB is **optional** (as usual),

CCCC is the repeated CCCC part from TTAAiiCCCC,

YYYYMMddhmmss is the date/time group

Note: gzip is used in the MET domain. The ideal situation is to define the same compression technique for all types of ICAO data. If different compression techniques were to be required, this will need to be coordinated and agreed globally.

The routing table will associate this TTAAiiCCCC data identifier with the AMHS addresses where the data should be sent to. The compressed file will be named with the suffix appropriate to the compression and sent onto AMHS.

FTBP name examples with METAR from LFPW:

A_LAFR31LFPW171500_C_LFPW_20151117150010.xml.gz

1st retarded bulletin: A_LAFR31LFPW171500RRA_C_LFPW_20151117150105.xml.gz

1st corrected bulletin: A_LAFR31LFPW171500CCA_C_LFPW_20151117150425.xml.gz

WMO defined T_1T_2 (from TTAaii) for the following IWXXM data types:

- Aviation Routine Report (*METAR*) LA
- Aerodrome Forecast ("*short*" TAF) (VT < 12 hours) LC
- Tropical Cyclone Advisory LK
- Special Aviation Weather Reports (*SPECI*) LP
- Aviation General Warning (*SIGMET*) LS
- Aerodrome Forecast ("*long*" TAF) (VT >= 12 hours) LT
- Volcanic Ash Advisory LU
- Aviation Volcanic Ash Warning (*VA SIGMET*) LV
- AIRMET LW
- Aviation Tropical Cyclone Warning (*TC SIGMET*) LY
- Space Weather Advisory (*SWXA*) LN

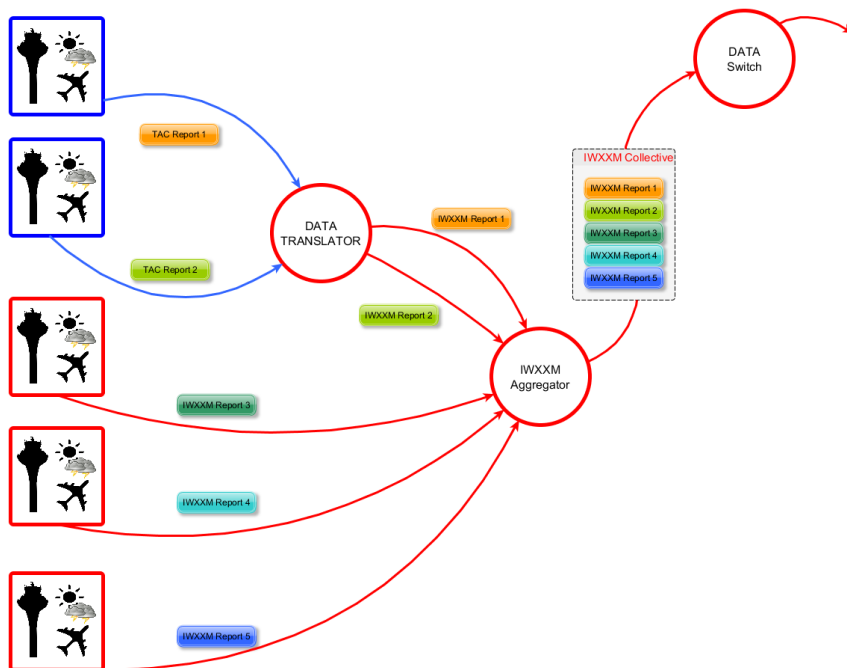


Figure 4: Aggregation of TAC and IWXXM data

5.1.5 International OPMET Databank

An International OPMET Databank (called Regional OPMET databank (RODB) in some regional documentation) will provide the capability for users to interrogate IWXXM data through the AFS in much the same way as the RODBs currently provide global TAC data.

There will be no TAC to IWXXM translation taking place by the Databank in case the requested OPMET is only available in TAC, as this translation should be done upstream by a Translation Centre, unless the databank has formal arrangements to convert TAC to IWXXM on behalf of a State.

Although the implementation of Net Centric Services is beyond the scope of this document, the Databank element could provide Net Centric services in addition to the AFS based IWXXM interrogation capabilities. As

soon as agreed descriptions of the interface to request data via web-services are available, this additional feature may be added for the databank.

For an IWXXM OPMET Databank, the following functions could be the subject of compliance testing.

- The Databank output shall conform to the IWXXM Schema;
- The Databank output shall pass IWXXM Schematron/business rules;
- The Databank has an AMHS interface supporting FTBP;
- Databank shall only send the response back to the originator;
- The Databank shall aggregate the reply reports according to the same rules used by the Data Aggregators;
- The Databank shall apply a correct filename to its output;
- The Databank base correctly compresses data applying an appropriate suffix; and
- The Databank shall respond correctly to the standard interrogations.

The picture below illustrates a possible implementation of an OPMET Databank with combined TAC and IWXXM functionalities.

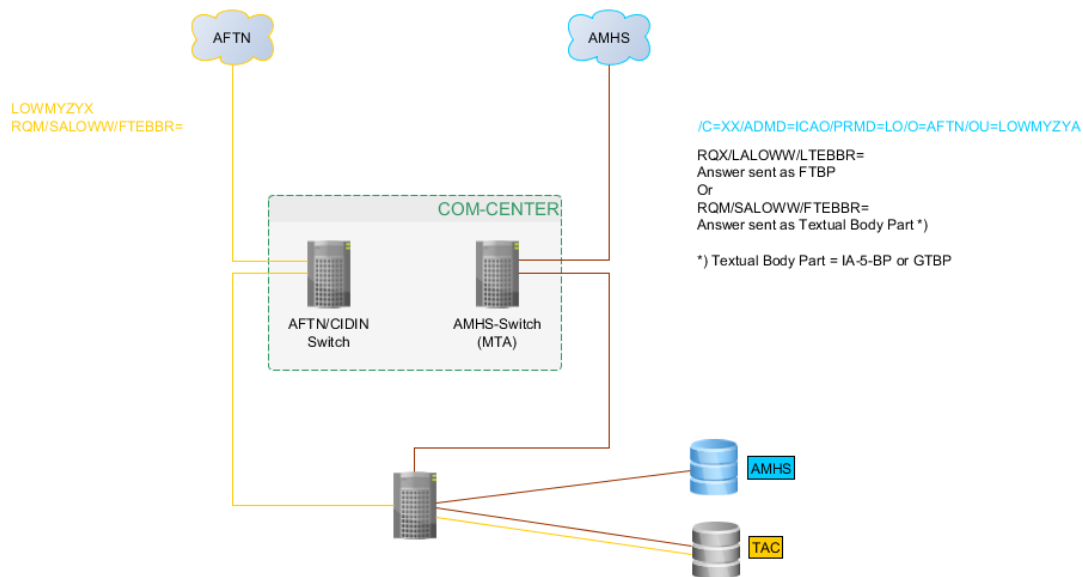


Figure 5: The implementation of a combined TAC & IWXXM Databank

Technical principles:

- Interfaces:
 - o the Databank has an AMHS P3 connection to the AMHS Message Transfer Agent (MTA) of a COM centre; and
 - o in case the COM Centre still serves AFTN users, the Databank may have a separate AFTN connection to the COM Centres AFTN switch or alternatively, the COM Centre will take care of the AFTN-AMHS conversion.
- Databank tables: data in IWXXM and data in TAC are stored in separate sets of tables.

Operational principles:

- DB Requests

- Requests for TAC data can be sent via AFTN or via AMHS as international reference alphabet number 5 (IA5) text). These requests will continue to work as described in the current RODB Interface Control Documents;
- Requests for IWXXM data shall be sent via AMHS as Textual Body Part;
- Requesting data in IWXXM will work in a similar way as requesting TAC data. The above example uses a syntax similar to the TAC requests, but:
 - “RQX/” is used as the start of the query
 - only the IWXXM T₁T₂ message types defined by WMO (see 5.1.4) are allowedFor example: RQX/LALOWW/LTEBBR/LSLFFF=
- Requests for TAC data and requests for IWXXM data shall not be mixed
- Any violation of the above principles (e.g. the request “RQX/LSLOWW=” received via AFTN), will result in an automatic reply sent by the databank, informing the user that this is not allowed.

- DB Replies

- Replies to TAC requests will continue to work as described in the current RODB Interface Control Documents.
- Reply reports of an IWXXM request will be aggregated into one or more files, according to the same rules used by the Data Aggregators, e.g. no mixing of message types in one file.
- These files will be compressed and a correct file name with appropriate suffix supplied.
- These files will be sent as FTBP through AMHS and directory services should be used to ensure the recipient is capable to receive this
- The RODB Interface Control Documents will specify an extended set of standardized information & error replies.

5.2 Regional Centres Definitions

5.2.1 National OPMET Centre (NOC)

The role of the NOC is to gather and validate all required AOP and agreed exchanged non AOP OPMET messages generated by all originating units within a State, to compile national data into bulletins and to distribute them internationally according to the regional distribution schema.

Note: It is assumed that the data provided by NOCs is in accordance with the similar specifications as applicable for an International Data Aggregator

5.2.2 Regional OPMET Centre (ROC)

In its Area of Responsibility (AoR) according to the regional distribution schema, a ROC is responsible for the collection from NOCs of all required AOP and agreed exchanged non AOP OPMET data and for the validation of these OPMET data.

Each ROC is responsible for the collection of these OPMET data from the other ROCs in the region and the dissemination to the other ROCs of these OPMET data from its AoR.

For IWXXM exchange, a ROC should perform the following functions:

- Data Aggregator;
- Data Translation centre; and

- Data Switch.

5.2.3 Interregional OPMET Gateway (IROG)

An IROG is responsible for the collection of all required AOP and agreed exchanged non AOP OPMET data from its Interregional Area(s) of Responsibility (IAoR) and its dissemination to the ROCs in its region. Furthermore, the IROGs are responsible for collection and dissemination of their Region's required OPMET data to their partner IROGs.

The IROG is responsible for the validation of the bulletins sent to the IROGs of its IAoR and received from their IAoR.

For IWXXM exchange, an IROG should perform the following functions:

- Data Aggregator
- Data Translation Centre
- Data Switch

5.2.4 International OPMET Databank

The International OPMET Databank(s) (called Regional OPMET databank (RODB) in some regional documentation and further labelled RODB in this document) are supplied with required OPMET data by the ROCs. These databases can be queried via the AFS by using a specified query language. Details on the query language as well as the supported data types can be found in Regional Interface Control Documents for OPMET Database Access Procedures. Those documents should be updated to integrate the new functions.

A RODB shall be able to fulfil the requirements to handle IWXXM-code as described in paragraph 5.1.5.

6 Generation and use of IWXXM

The IWXXM format is not intended to be read in its raw form by humans. It is intended as a structured, 'machine to machine' message that is then subsequently processed for human interpretation/interaction.

6.1 Operational Status Indicator (PermissibleUsage)

Under certain circumstances it has been and will continue to be necessary to distribute meteorological information for test and exercise purposes. To support this need, the IWXXM schema may incorporate non-operational flags.

6.1.1 Definition of Operational and Non-Operational messages

An operational message is one that is intended to be used as the basis for operational decision making. As such, the content of the message may result in decisions that may affect any or all phases of flight by any authorised and competent stakeholder (i.e. air navigation service providers, airport authorities, pilots, flight dispatchers etc). Recipients of such messages (either automatic or human) would therefore expect that the information is sourced from a competent entity and that originating equipment (sensors etc) are serviceable and that any human involvement is carried out by qualified, competent personnel.

A non-operational message is one that is not intended to be used for operational decision making, even though it may contain realistic data (particularly during an exercise). Recipients of such messages shall ignore the content of the message with regard to decision making. Non-operational messages may be further classified as either being related to TEST or EXERCISE.

Definition of Test and Exercise.

There is no known official definition of TEST or EXERCISE within the ICAO lexicon. In some instances, the two words are used interchangeably. Since the use of TEST or EXERCISE would only be used in messages identified as NON-OPERATIONAL, there are circumstances where one may be more appropriate than the other.

TEST messages may be issued for the following reasons:

- As an ad-hoc message to test distribution of a particular message, such as SIGMET when, for example, a new system is installed at an originating centre.
- As part of a more organised test of message routing for non-scheduled messages such as SIGMET.
- As part of the process to introduce IWXXM messages by a particular entity. In this instance, IWXXM messages may be issued on a regular basis over a period of weeks or months in advance of OPERATIONAL status.

In the above cases the messages may contain either realistic data or no data.

EXERCISE messages may be issued for the following reasons:

- As a national or regional (or more rarely 'global') organised event intended to permit stakeholders to become familiar with the data content of messages. An example would be for Regional Volcanic Ash Exercises where stakeholders wish to provide training and 'desk top' scenarios for rare events.
 - Under exercise scenarios, the messages will contain realistic data (though not necessarily valid data). For instance, volcanic ash exercises sometimes use volcanic ash data based on historical wind patterns to ensure that the requisite training is provided (i.e. to ensure the volcanic ash data impacts particular FIRs).
-

Operational Messages:

- Every IWXXM message that is issued for operational purposes shall set the IWXXM element name 'permissibleUsage' to OPERATIONAL.
- Under such circumstances no other information relating to OPERATIONAL status shall be included.

Non-Operational Messages:

- Every IWXXM message that is issued for non-operational purposes shall set the IWXXM element name 'permissibleUsage' to NON-OPERATIONAL.
- Under such circumstances, it will be necessary to provide additional information relating to the reason for the non-operational status.
- The 'permissibleUsageReason' field shall be set to either TEST or EXERCISE.
- The 'permissibleUsageReason' field should contain a short description to provide further information. This is a free text field and is intended to contain the reason for the TEST or EXERCISE. For example;
 - A Volcanic Ash Exercise message may include the name of the exercise in this field 'EUR VOLCEX16'.
 - An organised regional SIGMET test may likewise include 'APAC SIGMET TEST 02 Nov 2016'.
 - For an entity initially issuing IWXXM data as it enters the final phase of transition to IWXXM, production may include 'TEST IWXXM DATA PRE-OPERATIONAL' or similar.
 - Whilst the 'permissibleUsageReason' field may be left empty, this is not considered to be good practice. Where possible, the field should contain some description of the reason for the TEST or EXERCISE.

The examples below are provided for reference:

Example 1: Operational IWXXM data

```
<IWXXM:CLASSNAME ... permissibleUsage="OPERATIONAL">...</IWXXM:CLASSNAME>
```

Example 2: 'Test' IWXXM data

```
<IWXXM:CLASSNAME ... permissibleUsage="NON-OPERATIONAL" permissibleUsageReason="TEST" permissibleUsageSupplementary="EUR SIGMET TEST 17/09/2018">...</IWXXM:CLASSNAME>
```

Example 3: 'Exercise' IWXXM data

```
<IWXXM:CLASSNAME ... permissibleUsage="NON-OPERATIONAL" permissibleUsageReason="EXERCISE" permissibleUsageSupplementary="EUR VOLCEX 12/03/2018">...</IWXXM:CLASSNAME>
```

Notwithstanding the explicit inclusion of TEST and EXERCISE indicators in all IWXXM messages, it is considered to be best practice to always forewarn stakeholders of TEST events, and in particular EXERCISE events, whenever possible. The message originator, and/or the EXERCISE coordinator where applicable, should consider the most appropriate method to notify stakeholders. A non-exhaustive list of methods would include, State Letter, Exercise Directives, administrative messages, and emails.

It should be noted that, independently of the status of the data, the distribution of data should remain the same (whether the permissibleUsage is OPERATIONAL or NON-OPERATIONAL).

6.2 Unique GML.ID

The gml.id attribute is required to be unique within a XML/GML document. It is not difficult for an IWXXM message creator to make all gml:id unique with the use of, say, natural keys, however when similar types of IWXXM messages like METAR/SPECI or TAF are aggregated (with the use of the COLLECT schema for example), there may be cases of overlap if natural keys are used.

Therefore it is recommended Version 4 of Universal Unique Identifier (UUID - a 128-bit number) is used for gml:id to uniquely identify the object or entity. A fragment of IWXXM METAR message aggregated with COLLECT schema showing the use of UUIDv4 in gml:ids is as follows:

```
<collect:MeteorologicalBulletin ... gml:id="uuid.6f353602-12a1-40a7-b6b5-3edb14c6241e">
<collect:meteorologicalInformation>
<iwxxm:METAR ... gml:id="uuid.15ff064a-6dc4-41e0-bafa-8ee78ed4dc25">
```

...

A schematron rule should be added from IWXXM v3 to mandate the use of UUIDs in gml:id for IWXXM messages.

6.3 Translating TAC to IWXXM

A Translation Centre will typically be placed after the National OPMET Centre (NOC) or Regional OPMET Centre (ROC) or Regional OPMET Data Bank (RODB) and its correction facilities, if any. Correction will not typically be applied by the Translation Centre but the ROC, NOC or RODB.

When generating the IWXXM, the translator shall include IWXXM fields which define where and when the translation has been carried out in order to provide traceability. This shall be achieved by introducing agreed metadata elements (centre identifier and time stamp) that is part of IWXXM.

Amendment 78 to ICAO Annex 3 includes TEST and EXERCISE fields in the TAC templates for SIGMET, AIRMET, VAA and TCA (with applicability of November 2019) since these non-scheduled messages are from time to time issued during tests and exercises. Until the changes in Annex 3 are implemented following its templates, it will be difficult for the translator to identify test messages. When uncertain, such as when translation fails, the IWXXM should always be presumed to be operational (refer to section 6.1) so that the original TAC message is available for reviewing by a human.

6.3.1 Pre-requisites for Translation Centres

The following items are considered pre-requisite for data translation centres:

- Operate on a permanent 24/7 basis with 24-hour support;
- Robust network between MET node and national AFS node (example, redundant or dual connectivity for the telecommunication links);
- Access to the incoming TAC data and outgoing IWXXM (an AMHS enabled AFS Centre supporting FTBP that is able to send IWXXM data to the AFS);
- Provide IWXXM bulletin compilation (collection) capability; and
- Archive of at least the last 28 days data and logs of at least on the last 2 months translation details (at minimum, full WMO header received, time of reception, rejection or not).

6.3.2 Data Validation

The data validation should be based upon the following:

- Annex 3 provisions / WMO regulations should be used as the basis of validating received TAC information.
- The most recent official version of the IWXXM schema/Schematron should be applied, unless an explicit agreement between the requiring centre and the Translation Centre is agreed.
- The format should be based upon WMO – No. 306, Manual on Codes, Volume I.1, Part A – Alphanumeric Codes FM where applicable; and the WMO FM201 (collect) and FM 205 (Met Information Exchange Model) should be followed.
- The aeronautical metadata descriptions follow AIXM schema. The process for updating metadata should be documented.

6.3.3 Incomplete (Partial) Translation

When TAC to IWXXM translation is necessary but fails, an IWXXM message of the corresponding type (METAR, TAF, ...) without any translated MET parameters but containing the original TAC message should be disseminated to users for their manual interpretation. It is also recommended that, if possible and where agreed, an error message be sent to the TAC originator encouraging the TAC originator to re-issue a valid TAC message for subsequent translation and distribution. Another possible policy would consist in having regular monitoring for a past period and communicate back pertinent elements on errors in coding policy to data originators, regional data exchange working groups and/or some users, where agreed.

Transmitting an IWXXM message with minimum data will allow users to monitor only a single meteorological data stream, reducing the dependency on the TAC stream.

The following minimum set of data should be considered:

METAR:

METAR (COR) CCCC YYGGggZ

TAF :

TAF (COR/AMD) CCCC YYGGggZ

SIGMET/AIRMET:

CCCC SIGMET | AIRMET ... VALID YYGGgg/YYGGgg

VAA :

DTG, VAAC

TCA:

DTG, TCAC

SWXA :

DTG, SWXC

where " | " indicates a logical "OR", "(group)" indicates an optional group

6.3.4 Monitoring Functions

The Translation Centre should monitor incoming TAC messages and keep statistics on the data received and IWXXM generated. The statistics collected should be based upon the detail of IWXXM Validation Statistics to be Gathered by ROCs and RODBs (section 8.1).

6.3.5 Validation of the Translator

A TAC to IWXXM Translator could be the subject of compliance testing of the following:

- The Translator output will conform to the agreed IWXXM Schema;
- The Translator output will pass IWXXM Schematron/business rules;
- The Translator will successfully translate a standard set of TAC test data;
- The Translator provides metadata related to when and where data have been translated (see section 4.1.3) - such metadata conforms to the agreed metadata structure; and
- The Translator will apply appropriate (defined) metadata following agreed ICAO rules e.g. for monitoring and validation issues.

The test cases and operated tests to demonstrate the capability of the translator should be made available on request.

The expected data quality on incoming TAC data should be clearly stated and the limitation on the translator (what will be done/what will not or cannot be done) should be stated.

6.3.6 Commencement of Translation Services

It is recommended that initially the Translator should generate data and set the Operational Status Indicator field as “non-operational” and disseminate the IWXXM to a reduced number of recipients wishing to receive the IWXXM to ensure that all the relevant procedures and operations are in place and are clearly understood.

If felt necessary, a learning strategy could be applied such as the reception for an agreed defined period, prior to the operational emission of the IWXXM data. During that period, there could also be another defined contact point on the TAC-producer side to be reached during business hours. In case of an incorrect/rejected TAC message, a procedure should be in place to contact the appropriate State and to request corrections to the incoming TAC.

The date to start the exchange of data operationally should be agreed.

6.3.7 Translation Agreement

The following elements should be contained in the service agreement between the Translation Centre and applicant State:

- Hours of Translation Centre operations (24 hours, 365 days a year);
- Business contact details (e.g. name, phone, email) for both the Translation Centre and the applicant State;
- Operational (24Hr) contact details for both the Translation Centre and the applicant State;
- Details of which data is to be translated (e.g. WMO Header(s) of TAC data, locations indicators, frequency);
- Details of whether and when the originator should be notified when translation of individual messages fails;
- IWXXM distribution details (AMHS addresses);
- Details of which metadata should be used to derive the limits of airspace (boundaries, base, top).
- The aeronautical metadata descriptions follow AIXM schema. The process for updating metadata should be documented.
- Archiving requirements; and
- Procedure on what will be done in case of a failure of all or part of the Translation Centre functionality.

7 Requirements to Transition

The first necessary step is to define the prerequisites in order to be able to exchange IWXXM OPMET data. This will impact not only the network itself, but also the Message Switching Systems and most of the end-user systems.

7.1 Phase 1: Pre-Requisites to Transition

Phase 1 was enabled by Amendment 76 to Annex 3 in November 2013.

To achieve an efficient transition towards IWXXM, Phase 1 activities focused in the following areas and the particular elements identified per area.

7.1.1 Managing the Transition

Regional group(s) should be designated to deal with the transition in order to further define and monitor:

- Intra-regional plan on AMHS infrastructure/links planning and IWXXM data exchange between the ROCs, and between the ROCs and RODBs.
- Intra-regional implementation plan on IWXXM data exchange planning by the States to their ROC.
- Agreement to define how the testing platform and software should be made available and accessible to each State.

It is desirable that responsible group(s) for managing the transition in each ICAO regions be identified and established, that could be responsible for defining the Regions structure and capabilities in the context of the framework.

Furthermore, a full liaison should be established and maintained between the ICAO groups in charge of meteorology & data exchange and groups in charge of the AFS network.

For data translation purposes, if there is a systematic need for the translation of data on behalf of a State, this may be performed by the dedicated ROC for the part of the region under its Area of Responsibility and the IROGs for the interregional distribution.

7.1.2 Documentation

The region should define and have a plan in place to provide IWXXM data. This plan shall be published and maintained by the designated responsible groups (FAQ's etc. should be available).

ICAO and WMO documentation and provisions should be published/available describing the IWXXM code itself as well as documentation referencing the appropriate schemas and rules made available in order to handle this new format.

Cyber Security

Appropriate AFS security elements should be defined by the ICAO groups in charge of information management / networks in order to introduce the operational exchange of IWXXM data via extended AMHS.

It is recommended that appropriate malware and anti-virus precautions are exercised as a bare minimum when dealing with FTBP messages.

7.1.3 Processes

An agreed process should be defined to ensure that data generated by Data Producers are compliant. In order to promote the use of IWXXM, the process should be widely known and shared and some tools to check the compliance state of the data easily accessible and usable.

An identical process should be agreed to initiate and enable the IWXXM exchange between regions.

An AMHS network will be available to support exchange IWXXM data by the use of FTBP between those States wishing to do so. Corresponding AMHS connections should be made available between those Regions exchanging IWXXM data.

Source of Metadata

Updated processes, or notification on modifications about Aeronautical information metadata by the States, should be in place at the end of the period, or metadata sources should be defined and agreed.

Action Plan to Reduce Formatting Errors

Actions plans based on monitoring results about OPMET data not following the agreed coding rules should be undertaken in order to assist States in detecting and correcting incorrect coding policies.

A task should be started to define a procedure that the ROC may use on how to deal with errors in IWXXM-messages, in particular taking into account errors detected in converting TAC-reports. This procedure would ideally provide a clear description on how to report errors to a State that provides these data and clearly define the service and its limitation.

Interregional Cooperation/Coordination

The following tasks should be started:

- The updated processes and notification on modifications on IWXXM bulletins headers between adjacent regions.
- Identification of the interregional exchanges solely based on required AOP and agreed exchanged non-AOP data: actions plans to define clearly the interregional data/bulletins to be exchanged.
- Interregional plan to follow the AMHS infrastructure/links planning between AFS nodes supporting interregional data exchange of neighbouring IROGs.
- Implementation plan for interregional exchange between IROGs.
- An update process to introduce IWXXM in the contingency plans for the IROGs.

7.2 Phase 2: From Nov 2016 until IWXXM Exchange is a Standard

The following elements should be ready prior to the exchange of OPMET data in IWXXM format becoming an ICAO Annex 3 standard, which is defined in Amendment 78, with effect in November 2020.

7.2.1 Operations

- The ROCs & IROGs should have the capability to aggregate and switch IWXXM data.
- The ROCs & IROGs may have the capability to act as translation centres.
- Each NOC should be ready to exchange IWXXM data at the end of the period.
- The RODBs should have all the capabilities to deal with IWXXM data as well as TAC data.
- Update process or notification on modifications about metadata should be in place not later than the end of the period.
- The standard set of queries for IWXXM data for a RODB should be implemented and documented.
- Updated processes and notification on modifications on IWXXM bulletins headers between adjacent Regions should be in place and tested.

Institutional and Technical Issues

- A communication plan should be established and enacted to inform States and users - both from ICAO and WMO - about the IWXXM code, the metadata use, and the new procedures to access the RODBs.
- The IWXXM model should integrate the metadata related to Data Aggregator and Data Translator functions.
- A procedure used by the ROC should be in place on how to deal with errors in IWXXM-messages, in particular taking into account errors detected when converting TAC-reports. This procedure includes items on how to report errors to a State that provides these data.

Action Plan about data validation

- 'Validation' (validation against the XML schema) is the specific monitoring and gathering of statistics on schema conformance rather than meteorological data quality.
- Action plans based on monitoring results about TAC data not following the agreed coding rules should be in place in order to assist States in detecting and correcting incorrect coding policies.
- A procedure that the ROC can use on how to deal with errors in IWXXM-messages, in particular taking into account errors detected in converting TAC-reports, should be agreed on and made available. This procedure would ideally provide information on how to report errors to a State that provides these data and clearly define this service and its limitation.
- Messages that do not pass validation against the XML schema will continue to be passed and not rejected by ROCs/RODBs.
- States shall arrange the validation of their IWXXM messages against the corresponding XML schema, and make corrections to the process of generating their IWXXM messages as necessary, as per quality management processes.
- The ROC/RODB should conduct validation of IWXXM messages within their region/area of responsibility, excluding validation of 'State extensions'.
- ROC/RODBs should gather statistics on long-term validation results, broken down by State and Region, and provide this information to the relevant ICAO Regional Office and the METP (in particular WG-MIE and WG-MOG) to identify common or troublesome data quality issues.
- Users should be encouraged to continue to validate messages and they will remain responsible for making sure that the received IWXXM messages are suitable for their purposes.
- Users should review the IWXXM PermissibleUsage field to determine whether the message is suitable for operational, test or exercise purposes.

Regional Coordination/Planning

The regional group(s) designated to deal with the transition should define and monitor:

- Intra-regional plans regarding AMHS infrastructure/links and IWXXM data exchange between the ROCs, and between the ROCs and RODBs.
- Intra-regional plans regarding the IWXXM data exchange by the States to their ROC.
- The Contingency plans for the ROCs should integrate the IWXXM data and be ready before the end of the period.
- Testing platform and software are made available and accessible for every State.

Interregional Cooperation/Coordination

- The interregional mechanism to follow the AMHS infrastructure/links planning between AFS nodes supporting interregional data exchange between IROGs should be in place, as should the interregional procedure to notify the changes and new IWXXM bulletins introduction.
- The Contingency plans for the IROGs should include the IWXXM data exchange and be ready at the end of the period.
- It is proposed that bilateral agreements between neighbouring IROGs are set up for the translation of TAC data. This agreement should include notification processes on IWXXM data newly produced by the specific Region.

Figure 6 below provides an example of the ICAO Region 1 interfacing with two other ICAO Regions. In this example, it is assumed that:

- There is no operational exchange of IWXXM data between Region 1 and Region 3.
- There is operational exchange of IWXXM data between Region 2 and Region 1.

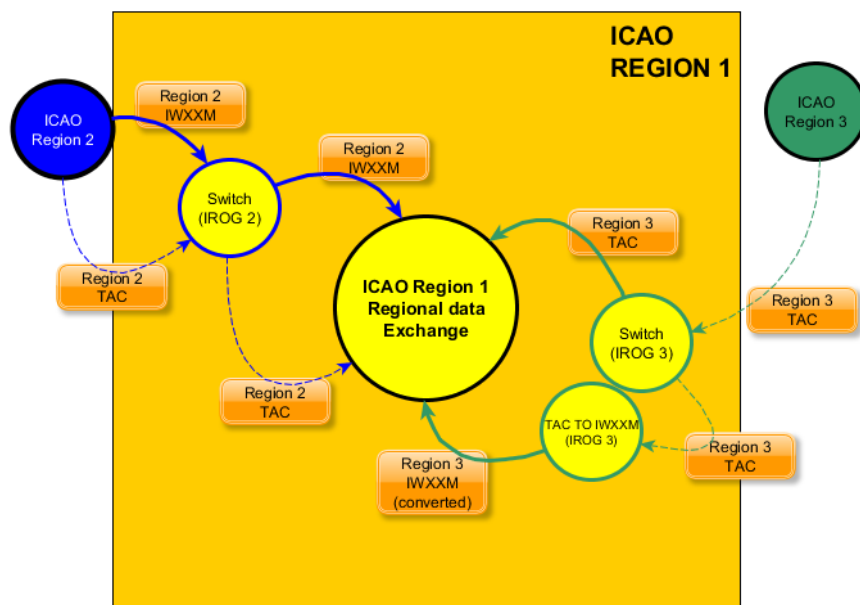


Figure 6: Phase 2, interregional exchange of OPMET with Region 2 (IWXXM & TAC capable) and Region 3 (TAC capable)

7.3 Phase 3: After IWXXM Exchange becomes a Standard

This section is reserved for capability that should be ready from ICAO Annex 3 Amendment 79 applicability date and is yet to be populated.

8 Data Validation and Statistics

8.1 IWXXM Validation Statistics to be Gathered by ROCs an RODBs

Regions should invite their ROCs, IROGs, and/or RODBs to provide statistics about IWXXM data reception, state of compliance of the received data, IWXXM version used, data volume etc. as a measure of the state of IWXXM implementation.

This section defines the general rules about gathering statistics with the aim of providing and proposing a globally consistent way of defining such statistics, assisting the inter-regional comparison and providing a solid bases for the regions to use those statistics as a way to measure IWXXM implementation progression.

8.1.1 Data and Type of Data

Regular Data

The location indicators for regular data should be ICAO compliant indicators (as available on integrated Safety Trend Analysis and Reporting System (iSTARS)) and in conformance with the MET tables defined in the eANPs. For METAR and TAF, it should be noted that the eANP is only required to reference the AOP aerodromes and therefore the minimum set of statistics should be the regular data (i.e. METAR, TAF) related to AOP aerodromes. In addition, if desired, statistics on the agreed exchanged non-AOP aerodromes data can be provided. A clear distinction should appear while presenting statistics to easily discriminate data related to AOP aerodromes from non-AOP aerodromes, where those last ones are presented.

The statistics for IWXXM data should be identical to those provided for TAC data, so as to provide a clear comparison between TAC and IWXXM data produced for the same location and to provide the number of received messages per day (not NIL, not corrected or amended).

Whilst the validation of all messages is encouraged, NIL data, TAF amendments and corrections should not be taken into consideration while producing statistics. The type of TAF (short or long) is defined in eANP Volume II and may be considered to measure the ad-equation to the requirements, if some indices are used in addition to basic statistics.

Non-regular data

The location indicators for non-regular data should also be ICAO compliant indicators (as available on iSTARS) and in conformance with the MET tables defined in the eANPs. For SIGMET, and where applicable AIRMET, they refer to FIR, FIR/UIR, CTA.

The statistics should also be available for VAA and TCA, and for space weather when implemented.

8.1.2 Proposed Statistics

Availability

Availability statistics for IWXXM data should be identical to those provided for TAC data, so as to provide a clear comparison between TAC and IWXXM data produced for the same location and provide the number of received messages per day, not NIL, not corrected, not amended (including not cancelled for TAF). For AIRMET and SIGMET, the cancelled data should not be considered. For VAA and TCA, the number of VAA and TCA per VAAC and TCAC respectively should be provided.

The statistics for VAA/TCA is by nature more complex as the VAA/TCA may refer to VA/TC in other regions, cover multiple FIRs and does not directly refer to location indicators. The distinction between a VAA/TCA that concerns specific region can only be derived by analysing the MET content. Therefore, basic statistics about VAA/TCA reception by the ROC/RODB from the VAAC/TCAC may be considered as a starting point, without any consideration of the content.

Timeliness

Timeliness statistics for IWXXM data should be identical to those provided for TAC data, as to provide a clear comparison between TAC and IWXXM data produced for the same location. The statistics should take into consideration the same source of information as for availability.

Specific statistics about IWXXM model or version

IWXXM validation

The validation against schema/Schematron (i.e. success rate) should be provided. Statistics about the validation should be provided per IWXXM version and will provide a good indication on what data are produced for which IWXXM version.

Acceptance of different versions of IWXXM model

It should be determined whether IWXXM data which is in conformance with a previous version of IWXXM could be considered as "valid" or only the last published official version of IWXXM by the World Meteorological Organization (WMO). A clear policy is yet to be developed by ICAO.

It should be understood that, for statistical purposes, the production of statistics for all received versions is the only correct way to have a good measure of the disseminated products. Therefore, a statistic per station and per version (with the limits previously explained) should be provided, even if it should be unlikely to have different versions of IWXXM schema disseminated for the same location and same type of data. The statistics should provide which version is used for the dissemination of which data per location indicator (and VAAC/TCAC for VAA/TCA).

Operational/non-operational data

The statistics of non-operational versus the total number of data (i.e. percentage of non-operational reports delivered).

Incomplete/Partial Translations

The statistics of incomplete/partially translated versus the total number of reports.

Data volume

Statistics of total data volume for the same location indicator (VAAC/TCAC for VAA/TCA) and daily average/daily total volume.

Additional groups (extensions)

Some statistics could be presented about the number of data with extensions versus the total number of data (with and without extension) per location indicator (VAAC/TCAC for VAA/TCA).

Another statistic about the daily average/ daily total volume of extensions compared to the total volume of data per location indicator (VAAC/TCAC for VAA/TCA) could also be provided.

Optional statistics

ROCs/RODBs could also choose to provide additional statistics about validation failure, to identify deviations from the models, which could be used to derive systematic errors such as the inclusion of additional data elements via methods other than the global agreed way, non-conformance on cardinality or NIL reason for missing mandatory Annex 3 elements.

8.1.3 Statistics Presentation

Statistics should be made available and presented per ICAO region, then per State, then per location indicator (CCCC) with each time an aggregation of the provided statistics from the sub-levels to the upper level (CCCC → State → Region). For VAA/TCA, it should be presented per Region and then per VAAC/TCAC.

The statistics should be gathered on a daily basis, then by monthly basis. The statistics could be provided offline, the day after or some days after.

8.2 IWXXM Validation Statistics to be Gathered by SADIS & WIFS

The SADIS and WIFS Provider States are investigating the value and effort to produce global sets of statistics based upon the data received at their gateway. The details are likely to be the same or similar to those produced by ROCs or RODBs but this is yet to be confirmed.

9 Acronyms and Terminology

AFS	Aeronautical Fixed Service
AFTN	Aeronautical Fixed Telecommunication Network
AIXM	Aeronautical Information Exchange Model
AMHS	ATS Message Handling System
AMO	Aerodrome Meteorological Office
AoR	Area of Responsibility
APAC	ICAO Asia/Pacific Region
AvXML	Aviation XML
COM	Communication
DB	Databank
EUR	ICAO European Region
FAQ	Frequently Asked Questions
FASID	Facilities and Services Implementation Document
FIR	Flight information Region
FIXM	Flight Information Exchange Model
FTBP	File Transfer Body Part
GML	Geography Markup Language
IAoR	Interregional Area of Responsibility
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
IHE	IPM Heading Extension(s)
IPM	Interpersonal Messaging (AMHS)
IROG	Interregional OPMET Gateway
IUT	Implementation Under Test
IWXXM	ICAO Meteorological Information Exchange Model
METAR	Meteorological Aerodrome Report
METP	ICAO Meteorology Panel
MTA	Message Transfer Agent
MWO	Meteorological Watch Office
NDR	Non-Delivery Report
NOC	National OPMET Centre
OGC	Open Geospatial Consortium
OID	Object Identifier
OPMET	Operational Meteorological information

P3	Message Submission and Delivery Protocol
ROC	Regional OPMET Centre
RODB	Regional OPMET Databank (International OPMET Databank)
RQM	Meteorological Databank Request in TAC-format
RQX	Meteorological Databank Request in IWXXM-format
SIGMET	Significant Meteorological Information
SPECI	Special Meteorological Report
SWIM	System Wide Information Management
TAC	Traditional Alphanumeric Code Form
TAF	Aerodrome Forecast
TCA	Tropical Cyclone Advisory
UA	User Agent
VAA	Volcanic Ash Advisory
WMO	World Meteorological Organization
XML	Extensible Markup Language

Appendix A: AMHS Profile Information to Support IWXXM Exchange

1. Introduction

A number of standards have been established by ISO for Message Handling Systems.

In order to describe which standards or group of standards, together with options and parameters, are needed to accomplish a function, it is necessary to specify a profile. Such profiles have been standardized by ISO and are known as International Standardized Profiles (ISPs). Profiles standardize the use of options and other variations in the base standards and deal primarily with the use of implemented capabilities in order to meet requirements for interoperability and efficient interworking.

ICAO Doc 9880, Part II contains the detailed technical specifications for ATSMHS based on a number of international standards and ISPs, complemented by additional requirements. The basic and the extended ATSMHS services meet the basic requirements of the respective ISPs but additional features and supplementary functions are incorporated as necessary in ICAO Doc 9880, Part II. In order to express conformance requirements, i.e. static capability, ICAO Doc 9880, Part II uses the classification defined in the ISPs to include different levels of support (mandatory, optional, etc.). These requirements, applying to the related parameters or elements are specified in the form of Profile requirement lists (PRLs). In a limited number of cases, the PRLs may also include dynamic behaviour requirements, using another classification also defined in the ISPs.

It is noted that the classification of a feature as mandatory in the ISPs corresponds to a requirement regarding static capability, i.e. the ability to generate and/or receive, encode and/or decode a specific parameter, but not to use this parameter in every message sent or received. The same logic is applicable to ICAO Doc 9880, Part II and, as an example, the EUR AMHS Manual.

Furthermore, it is recalled that in ICAO Doc 9880, Part II, for the Basic ATS Message Handling Service, the interface between the ATS Message User Agent and the ATS Message Server has been left open, since this is often an implementation matter local to each AMHS Management Domain. Conversely, for the Extended ATS Message Handling Service, implementation of a P2/P3 or P2/P7 profile compliant with the relevant MHS ISP (among ISP AMH23 to AMH26) is mandated.

The question of compliance with a P2/P3 or P2/P7 ISP for AMHS conformance should be addressed in the context of an implementation making use of some functionalities part of the Extended Service, but not of the whole of it. In particular, it is not specified whether a partial Extended Service implementation which does not include AMHS Security requires conformance with one of the AMH23 to AMH26 profiles or not.

User agents may be implemented exclusively for the support of a specific application/service. Such dedicated user agents may not need to implement all the features defined by ICAO Doc 9880, Part II, and parts of regional AMHS Manuals, where defined. For example, dedicated user agents implemented for the exchange of OPMET data formatted based on the IWXXM model are not supposed to generate messages with SS priority. Similarly, these user agents are not expected to receive messages with SS priority, although this could happen at the reception direction, at least by mistake.

Mandating implementation of features which are not required by the application/service served by certain user agents may generate additional complexity and impose implementation delay, effort and cost, without any operational benefit. In order to eliminate such impediments and facilitate the adoption of the ATS Message Handling Service by end users, the need of defining application/service oriented AMHS profiles, which clarify requirements and may relax some of them by mandating less features than the current AMHS specification, should be recognized. The definition of an IWXXM profile which is applicable to explicit, limited environments, i.e. submission of OPMET data, taking into consideration which features are useless for the specific application/service. The relaxed requirements concern message submission only.

Implementations complying with an application/service oriented AMHS profile are accepted for connection to the AMHS, although possibly not fully compliant from a formal standpoint, provided that conformance to the AMHS IWXXM profile is verified.

2. AMHS Profile for OPMET IWXXM data exchange

AMHS is the intended communication means for MET IWXXM data exchanges using FTBP.

AMHS UAs complying with ICAO Doc 9880, Part II, Second Edition and where applicable, with the additional provisions of regional AMHS Manual, are capable to originate and receive AMHS messages containing such data. The support by UAs of IPM Heading Extensions (IHE), defined in ICAO Doc 9880, Part II as part of the Extended ATS Message Handling Service, is additionally required but represents a minor upgrade already available in several UA implementations.

However, to ensure unambiguous interpretation of messages upon reception, and to facilitate their origination, it is necessary to establish a detailed specification of X.400 and AMHS parameters to be adopted for conveyance of such messages, including those associated with the AMHS file-transfer-body-parts (FTBP).

2.1. Scope of the profile

This profile specification is established for application by AMHS UAs submitting and/or receiving OPMET data in IWXXM format through a P2/P3 or a P2/P7 interface, implemented as part of the following centres or systems:

- National OPMET Centre (NOC)
- Regional OPMET Centre (ROC)
- Interregional OPMET Gateway (IROG)
- Regional OPMET Databank (RODB)
- Any terminal or system receiving or requesting OPMET data in IWXXM format from one of the above centres/systems

This specification is based on the following assumptions, which identify topics out of scope of the AMHS profile, which are addressed in the MET domain:

- The MET domain may add further data types to the IWXXM without affecting the AMHS profile. It is assumed that irrespective of the data format (bulletin or report), the MET domain will always pass an unstructured binary file with a defined filename to the AMHS.
- Data compression will always be performed in the MET domain. The AMHS will not perform compression.
- The MET Domain will define procedures for the submission of RQX messages to RODBs.

2.2. Definition of the profile

A profile based on the exclusive use of the Extended Service shall be used. As a result the IPM-Heading-extensions (IHE) need to be used to carry the ATS priority, Filing time and Optional Heading Information. However, only some of the functional groups which are part of the Extended Service are needed for the profile, namely FTBP and IHE. More specifically, the profile does not require support of AMHS security.

2.2.1. Number of body parts

The IPM body shall contain exactly one body-part which is an FTBP.

The body part selection shall be as represented using the following tabular description.

Table 1: Body part selection for the IWXXM profile
(derived from ICAO Doc 9880 Part II Tables 3-1 and 3-2)

<i>Ref</i>	<i>Element</i>	<i>Doc 9880 static support (Extended Service) Orig/Rec</i>	<i>Doc 9880 reference</i>	<i>Dynamic action upon generation of IWXXM message</i>	<i>Value and/or comments</i>
Part 2: AMH21/A.1.3 IPM body					
1	ia5-text	O/M		X	
1.2	data	M/M	3.3.3	X	
10	bilaterally-defined	O/M	3.3.5	X	
Part 3: AMH21/A.1.3.1 Extended body part support					
1	ia5-text-body-part	O/M		X	
9	bilaterally-defined-body-part	O/M	3.3.5.1	X	
11	general-text-body-part	M/M	3.3.3 and Part 4, Table 3-1	X	
12	file-transfer-body-part	M/M	3.3.5.1 and 3.3.5.2	G	AMH21/ A.1.3.3
M = mandatory support (static support) O = optional support (static support) or optionally generated (dynamic behaviour) G = generated X = not used					

2.2.2. Selection of IPM heading parameters and parameter values

2.2.2.1. The IPM Heading parameter selection and values are listed in Table 2 below

**Table 2: IPM Heading parameters for the IWXXM profile
(derived from ICAO Doc 9880 Part II Table 3-2)**

<i>Ref</i>	<i>Element</i>	<i>Doc 9880 static support (Extended Service) Orig/Rec</i>	<i>Doc 9880 reference</i>	<i>Dynamic action upon generation of IWXXM message</i>	<i>Value and/or comments</i>
Part 1: AMH21/A.1.2 IPM heading fields					
1	this-IPM	M/M	3.1.2.2.1, 3.1.4.2.1 (AMH21 support)	G	
2	originator	M/M		G	Address of the originating OPMET system (MET switch)
3	authorizing-users	O/M		X	
4	primary-recipients	M/M		G	Recipient addresses are populated by the MET switch based on its routing table (EUR Doc 033 section 5 .1.4)
5	copy-recipients	M/M		X	
6	blind-copy-recipients	O/M		X	
7	replied-to-IPM	M/M		X	
8	obsoleted-IPMs	O/M		X	
9	related-IPMs	O/M		X	
10	subject	M/M		G	This field shall carry the TTAAiCCCCYYGGggBBB part of the filename of FTBP. It is assumed that the subject field is easier to access for human operators in case of retrieval or analysis of transferred messages
11	expiry-time	O/M		X	
12	reply-time	O/M		X	
13	reply-recipients	O/M		X	
14	importance	O/M		X	The receiving UA shall assume that this field takes its default value ("normal")
15	sensitivity	O/M		X	
16	auto-forwarded	O/M		X	
17	extensions	M/M	3.3.4.1	G	

<i>Ref</i>	<i>Element</i>	<i>Doc 9880 static support (Extended Service) Orig/Rec</i>	<i>Doc 9880 reference</i>	<i>Dynamic action upon generation of IWXXM message</i>	<i>Value and/or comments</i>
17.6	authorization-time	M/M	3.3.4.2	G	Equivalent to filing time
17.12	originators-reference	M/M	3.3.4.3	X	To avoid confusion with the use of this field in the IHE context (where it is carrying data converted to/from AFTN OHI)
17.13	precedence-policy-identifier	M/M	3.3.4.5, 3.3.4.6 and 3.3.4.7	G	OID value {iso (1) identified-organisation (3) icao (27) atm-amhs (8) parameters (0) amhs-precedence-policy (0)} (see Doc 9880, 3.3.4.7)

Part 4: AMH21/A.1.5 common data types

1	RecipientSpecific				
1.2	notification-requests	M/M	3.3.6	X	
1.2.1	m	M/M	3.3.6	X	IWXXM never use priority SS
1.2.2	nrn	M/M		X	Doc 9880 does not foresee the presence of nrn-request
1.4	recipient-extensions	M/M	3.3.4.1	G	
1.4.3	precedence	M/M	3.3.4.8	G	Equivalent to priority GG: precedence value = 28 (TAF, METAR/SPECI, and also in case of AMD, COR or RTD reports/bulletins) Equivalent to priority FF: precedence value = 57 (AIRMET, SIGMET, VAA, TCA)
2	ORDescriptor				
2.1	formal-name	M1/M1		G	used for originator-address and recipient-addresses

M = mandatory support (static support)

M1 = mandatory O/R name minimal support (static support)

O = optional support (static support) or optionally generated (dynamic behaviour)

G = generated

X = not used

2.2.2.2. Content of body parts

The parameters composing the FTBP shall be in line with the details provided in Table 3 below.

Note: The references to EUR DOC 020 have been indicated to provide more details, if needed.

Table 2: File Transfer parameters for the IWXXM profile

<i>Ref</i>	<i>Element</i>	<i>ATS Messaging Service Profile - static support Orig/Rec</i>	<i>European ATS Messaging Service Profile - Reference</i>	<i>Dynamic action upon generation of IWXXM message</i>	<i>Value and/or comments</i>
1	related-stored-file	-			
2	contents-type				
2.1	document-type				
2.1.1	document-type-name	M/M	A.2.4.2.1	G	default OID value: 1.0.8571.5.3 {iso(1) standard(0) 8571(8571) document- type(5) unstructured- binary(3)}
3	environment				
3.1	application-reference				
3.1.1	registered-identifier	O/M	A.2.4.2.2 and A.2.4.2.6	G	OID value: 1.3.27.8.1.2 {iso (1) identified- organisation (3) icao (27) atn-amhs (8) application (1) digital- met (2)}
3.4	user-visible-string	O/M	A.2.4.2.6	G	"Digital MET"
4	compression	-			See para below
5	file-attributes				
5.1	pathname				
5.1.1	incomplete-pathname	O/M	A.2.4.2.3	G	bulletin file name as specified in section 5.1.4
5.5	date-and-time-of-last- modification	O/M	A.2.4.2.4	O	

<i>Ref</i>	<i>Element</i>	<i>ATS Messaging Service Profile - static support Orig/Rec</i>	<i>European ATS Messaging Service Profile - Reference</i>	<i>Dynamic action upon generation of IWXXM message</i>	<i>Value and/or comments</i>
5.13	object-size				
5.13.2	actual-values	O/M	A.2.4.2.5	O	
6	extensions	-			
<p>M = mandatory support (static support) O = optional support (static support) or optionally generated (dynamic behaviour) G = generated X = not used</p>					

Compression of the data to be transferred, if needed, shall be performed in the MET domain before creating the FTBP. This avoids using the “compression” field of FTBP, reduces the UA complexity and limits the FTBP functionality to message exchange mechanisms.

The IWXXM data itself shall be included in the FileTransferData element of the file-transfer-body-part. It should be noted that ISO/IEC 10021-7 / ITU-T X.420 (section 7.4.12) specifies the ASN.1 encoding to be used, and that ISO/IEC ISP 12062-2 (section A.1.3.1) expresses additional recommendations regarding this encoding, which should be “octet-aligned EXTERNAL”. Only one EXTERNAL component should be used.

2.2.2.3. Selection of used P3/P1 envelope parameter values

The mapping of P2 parameters onto P3 envelope parameters shall be as specified in ICAO Doc 9880 and X.420.

IPMs with a precedence value of 28 shall use the priority abstract-value “non-urgent”. IPMs with a precedence value of 57 shall use the priority abstract-value “normal”.

The encoded-information-types in the P3 submission-envelope shall be limited to the OID value specified for FTBP (see ITU-T X.420:1999 7.4.12.8, 20.4.c and Annex C), i.e. OID {joint-iso-itu-t(2) mhs(6) ipms(1) eit(12) file-transfer(0)}.

2.2.2.4. Relaxed requirements from complete AMHS specification

Implementers must be aware that due to the “relaxed” status of the requirements above, any of these requirements may be reverted back to a “mandatory” status in a future profile version, as soon as the need for the corresponding missing feature(s) appears operationally. Conformance with the profile implies a commitment to support such evolutions in the profile, which may be considered as “return-to-normal” in terms of AMHS conformance.

Appendix B: Sample Tests for NOCs to Conduct when Introducing IWXXM

Proposed Conformance Tests

1. General description

This section proposes a list of functional tests that allows verification of conformance of User Agent (UA) implementations dedicated for OPMET IWXXM data exchange.

The proposed conformance tests are divided to three categories:

- profile specific submission tests;
- profile specific delivery tests; and
- submission and delivery tests.

1.1 The scope of the profile specific submission and delivery tests is to ensure conformance of UA implementations specifically deployed for the conveyance of OPMET IWXXM data to the respective profile. A test identification scheme of the form WXMxnn has been used, where x=1 is used for submission tests and x=2 for delivery tests. Wherever applicable and to provide more details, reference to the respective EUR AMHS Manual Appendix D-UA test is made.

1.2 Specific UA conformance testing is to ensure that UA implementations dedicated for OPMET IWXXM data exchange will not malfunction upon reception of a field or element not defined by the specific profile, but classified as mandatory in the ISPs and thus also mandatory in AMHS.

2. tests

2.1. Profile specific submission tests

WXM101	Submission of an IPM including a bulletin consisting of METAR
Test criteria	The test is successful if the UA submits an IPM including a bulletin consisting of METAR according to the profile defined in Appendix A of this document
Scenario description	Submit from the UA under test an IPM including a bulletin consisting of METAR. Check that: <ul style="list-style-type: none"> - the P3 submission-envelope includes the following parameters with the correct values: <ul style="list-style-type: none"> ○ <i>originator-name</i>: OR-name of the originator ○ <i>recipient-name</i>: OR-name of each recipient of the message ○ <i>content-type</i>: 22 ○ <i>encoded-information-types</i>: OID 2.6.1.12.0 ○ <i>priority</i>: non urgent - the following IPM heading fields are present with the correct values: <ul style="list-style-type: none"> ○ <i>originator</i>: address of the originating OPMET system (MET switch) ○ <i>primary-recipients</i>: recipient addresses as populated by the MET switch

	<ul style="list-style-type: none"> ○ <i>subject</i>: TTAAiiCCCCYYGGggBBB part of the filename of FTBP ○ <i>importance</i>: normal, if present ○ <i>authorization-time</i> of the IPM heading extensions field: equivalent to filing time ○ <i>precedence-policy-identifier</i> of the IPM heading extensions field: OID 1.3.27.8.0.0 ○ <i>originators-reference</i> of the IPM heading extensions field: absent <p>- the following elements in the common data types are present with the corresponding values:</p> <ul style="list-style-type: none"> ○ <i>precedence</i>: 28 ○ <i>formal-name</i>: originator address and recipient addresses <p>- the elements <i>rn</i> and <i>nrn</i> in the common data types are absent</p> <p>- the message has exactly one file-transfer-body-part</p> <ul style="list-style-type: none"> - the parameters composing FTBP are according to ISO/IEC ISP 12062-2 (see section A.2.4.2 of the EUR AMHS Manual Appendix B) and the following elements are present with the correct values: <ul style="list-style-type: none"> ○ <i>document-type-name</i>: OID 1.0.8571.5.3 ○ <i>registered-identifier</i>: OID 1.3.27.8.1.2 ○ <i>user-visible-string</i>: 'Digital MET' ○ <i>incomplete-pathname</i>: bulletin file name as specified in section 5.1.4 for example: A_LAFR31LFPW171500_C_LFPW_20151117150010.xml.[compression_suffix] ○ If generated, check the element <i>date-and-time-of-last-modification</i> ○ If generated, check the element <i>actual-values</i>, the value of which represents the size of the Attachment data in bytes <p>- the elements <i>related-stored-file</i>, <i>compression</i> and <i>extensions</i> of the FTBP parameters are absent</p> <p>- The IWXXM data itself are included in the FileTransferData element of the file-transfer-body-part; the octet-aligned encoding should be used.</p>
EUR AMHS Manual, Appendix D-UA ref:	CTUA1501, FTBP Capability

WXM102	Submission of IPMs including bulletins of different file size consisting of METAR
Test criteria	The test is successful if the UA submits several IPMs including bulletins of different file size consisting of METAR according to the profile defined in Appendix A of this document.
Scenario description	<p>Submit from the UA under test a sequence of several IPMs including each time a bulletin of different file size consisting of METAR.</p> <p>The size of the message should not exceed the limit defined in r the regional AMHS Manual.</p> <p>Check all parameters listed in test case WXM101, with the corresponding values.</p> <p>If the element <i>actual-values</i> is generated check each time the respective value, which represents the size of the Attachment data in bytes.</p>
EUR AMHS Manual Appendix D-UA ref:	CTUA1501, FTBP Capability with different body-part size

WXM103	Submission of an IPM including a bulletin consisting of SPECI or TAF
Test criteria	The test is successful if the UA submits an IPM including a bulletin consisting of SPECI or TAF according to the profile defined in Appendix A of this document
Scenario description	<p>Submit from the UA under test an IPM including a bulletin consisting of SPECI.</p> <p>Check that all parameters and their respective values are in accordance to test case WXM101, except that the value of the element <i>incomplete-pathname</i> is according to the bulletin file name as specified in section 5.1.4 .</p> <p>The test is repeated with the submission of an IPM including bulletin consisting of TAF.</p>
EUR AMHS Manual Appendix D- UA ref:	CTUA1501, FTBP Capability

WXM104	Submission of an IPM including a bulletin consisting of AIRMET
Test criteria	The test is successful if the UA submits an IPM including a bulletin consisting of AIRMET according to the profile defined in Appendix A of this document.
Scenario description	<p>Submit from the UA under test an IPM including a bulletin consisting of AIRMET.</p> <p>Check that all parameters and their respective values are in accordance to test case WXM101, except that:</p> <ul style="list-style-type: none"> - the <i>priority</i> abstract value of the P3 submission-envelope is normal - the value of the element <i>precedence</i> is 57 - the value of the element <i>incomplete-pathname</i> is according to the bulletin file name as specified in section 5.1.4.
EUR AMHS Manual Appendix D- UA ref:	CTUA1501, FTBP Capability

WXM105	Submission of an IPM including a bulletin consisting of SIGMET or VAA or TCA
Test criteria	The test is successful if the UA submits an IPM including bulletin consisting of SIGMET or VAA or TCA according to the profile defined in Appendix A of this document.
Scenario description	<p>Submit from the UA under test an IPM including a bulletin consisting of SIGMET.</p> <p>Check that all parameters and their respective values are in accordance to test case WXM101, except that:</p> <ul style="list-style-type: none"> - the <i>priority</i> abstract value of the P3 submission-envelope is normal - the value of the element <i>precedence</i> is 57 - the value of the element <i>incomplete-pathname</i> is according to the bulletin file name as specified in section 5.1.4. <p>The test is repeated with the submission of an IPM including bulletin consisting of VAA.</p> <p>The test is repeated with the submission of an IPM including bulletin consisting of TCA.</p>
EUR AMHS Manual Appendix D- UA ref:	CTUA1501, FTBP Capability

WXM201	Delivery of an IPM including a bulletin consisting of METAR
Test criteria	The test is successful if an IPM, including a collection consisting of METAR, sent by an MTA is received by the UA under test and the parameters specified by the profile defined in Appendix A of this document are properly received.
Scenario description	<p>The MTA sends an IPM including a bulletin consisting of METAR.</p> <p>Check that the UA under test receives the IPM with the following parameters:</p> <ul style="list-style-type: none"> - the message delivery envelope includes the following parameters with the correct values: <ul style="list-style-type: none"> o <i>originator-name</i>: OR-name of the originator o <i>this-recipient-name</i>: OR-name of the recipient to whom the message is delivered o <i>content-type</i>: 22 o <i>encoded-information-types</i>: OID 2.6.1.12.0 o <i>priority</i>: non urgent o <i>message-delivery-identifier</i>: it shall have the same value as the message-submission-identifier supplied to the originator of the message when the message was submitted (X.411, section 8.3.1.1.1.1) o <i>message-delivery-time</i>: it contains the time at which delivery occurs and at which the MTS is relinquishing responsibility for the message (X.411, section 8.3.1.1.1.2) - the following IPM heading fields are present with the correct values: <ul style="list-style-type: none"> o <i>originator</i> o <i>primary-recipients</i> o <i>subject</i>: TTAAiCCCCYYGGgBBB part of the filename of FTBP o <i>importance</i>: normal, if present o <i>authorization-time</i> of the IPM heading extensions field: equivalent to filing time o <i>precedence-policy-identifier</i> of the IPM heading extensions field: OID 1.3.27.8.0.0 o <i>originators-reference</i> of the IPM heading extensions field: absent - the following parameters in the common data types are present with the corresponding values: <ul style="list-style-type: none"> o <i>precedence</i>: 28 - the elements <i>rn</i> and <i>nrm</i> in the common data types are absent - the message has exactly one file-transfer-body-part - the parameters composing the FTBP are according to section A.2.4.2 of the EUR AMHS Manual Appendix B and the following elements are present with the correct values: <ul style="list-style-type: none"> o <i>document-type-name</i>: OID 1.0.8571.5.3 o <i>registered-identifier</i>: OID 1.3.27.8.1.2 o <i>user-visible-string</i>: 'Digital MET' o <i>incomplete-pathname</i>: bulletin file name as specified in section 5.1.4 IWXXM CONOPS, for example: A_LAFR31LFPW171500_C_LFPW_20151117150010.xml.[compression_suffix] o If generated, check the element <i>date-and-time-of-last-modification</i> o If generated, check the element <i>actual-values</i>, the value of which represents the size of the Attachment data in bytes

	<ul style="list-style-type: none"> - the elements <i>related-stored-file</i>, <i>compression</i> and <i>extensions</i> of the FTBP parameters are absent - The IWXXM data itself are included in the FileTransferData element of the file-transfer-body-part; the octet-aligned encoding should be used.
EUR AMHS Manual Appendix D- UA ref:	CTUA1601, FTBP Capability

WXM202	Delivery of IPMs including bulletins of different file size consisting of METAR
Test criteria	The test is successful if several IPMs, including bulletins of different file size consisting of METAR, sent by an MTA are received by the UA under test and the parameters specified by the profile defined in Appendix A of this document are properly received.
Scenario description	<p>The MTA sends a sequence of several IPMs including each time a bulletin of different file size consisting of METAR.</p> <p>Check that the UA under test receives all IPMs and that the parameters described in test case WXM201 are received with the corresponding values.</p> <p>If the element <i>actual-values</i> is present check each time the respective value, which represents the size of the Attachment data in bytes.</p>
EUR AMHS Manual Appendix D- UA ref:	CTUA1601, FTBP Capability with different body-part size

WXM203	Delivery of an IPM including a bulletin consisting of SPECI or TAF
Test criteria	The test is successful if an IPM, including a bulletin consisting of SPECI or TAF, sent by an MTA is received by the UA under test and the parameters specified by the profile defined in Appendix A of this document are properly received.
Scenario description	<p>The MTA sends an IPM including a bulletin consisting of SPECI.</p> <p>Check that the UA under test receives the IPM and the parameters described in test case WXM201 are received with the corresponding values, except the element <i>incomplete-pathname</i> which value is according to the bulletin file name as specified in section 5.1.4.</p> <p>The test is repeated with the delivery of an IPM including a bulletin consisting of TAF.</p>
EUR AMHS Manual Appendix D- UA ref:	CTUA1601, FTBP Capability

WXM204	Delivery of an IPM including a bulletin consisting of AIRMET
Test criteria	The test is successful if an IPM, including a bulletin consisting of AIRMET, sent by an MTA is received by the UA under test and the parameters specified by the profile defined in Appendix A of this document are properly received.
Scenario description	<p>The MTA sends an IPM including a bulletin consisting of AIRMET.</p> <p>Check that the UA under test receives the IPM and the parameters described in test case WXM201 are received with the corresponding values, except that:</p> <ul style="list-style-type: none"> - the <i>priority</i> abstract value of the P3 submission-envelope is normal - the value of the element <i>precedence</i> is 57

	- the value of the element incomplete-pathname is according to the bulletin file name as specified in section 5.1.4 .
EUR AMHS Manual Appendix D-UA ref:	CTUA1601, FTBP Capability

WXM205	Delivery of an IPM including a bulletin consisting of SIGMET or VAA or TCA
Test criteria	The test is successful if an IPM, including a bulletin consisting of SIGMET or VAA or TAF, sent by an MTA is received by the UA under test and the parameters specified by the profile defined in Appendix A of this document are properly received.
Scenario description	<p>The MTA sends an IPM including a bulletin consisting of SIGMET.</p> <p>Check that the UA under test receives the IPM and the parameters described in test case WXM201 are received with the corresponding values, except that:</p> <ul style="list-style-type: none"> - the <i>priority</i> abstract value of the P3 submission-envelope is normal - the value of the element <i>precedence</i> is 57 - the value of the element incomplete-pathname is according to the bulletin file name as specified in section 5.1.4. <p>The test is repeated with the delivery of an IPM including a bulletin consisting of VAA.</p> <p>The test is repeated with the delivery of an IPM including a bulletin consisting of TCA.</p>
EUR AMHS Manual Appendix D-UA ref:	CTUA1601, FTBP Capability

The execution of the delivery tests defined in [EUR DOC 020 \(EUR AMHS Manual\) Appendix D-UA](#) is encouraged.

However if this is not possible, the following test list from EUR DOC 020 (EUR AMHS Manual) Appendix D-UA is suggested.

Basic Delivery Operations (A2)	
CTUA201	Deliver an IPM to the IUT – basic capability (A2)
CTUA203	Deliver an IPM containing optional-heading-information in the ATS-message-header
CTUA204	Deliver an IPM containing different kinds of recipient addresses
CTUA206	Deliver an IPM with invalid originator address similar to CAAS
CTUA207	Deliver an IPM with invalid originator address similar to XF

Specific Delivery Operations	
CTUA401	Deliver a non-delivery report (NDR) to an AMHS user

Enhanced Delivery UA Capability	
CTUA601	Deliver an IPM with the implemented capability of one body-part

CTUA602	Deliver an IPM with the implemented capability of two body-parts
----------------	---

Delivery Operations (A2-IHE)	
CTUA1201	Deliver an IPM with IHE to the IUT – basic capability (A2-IHE)
CTUA1203	Deliver an IPM with IHE, containing optional heading information
CTUA1204	Deliver an IPM with IHE, containing different kinds of recipient address

Specific Submission Operations with IHE	
CTUA1303	Checking of default envelope elements (flag setting) in submitted IPMs with IHE

Specific Delivery Operations with IHE	
CTUA1401	Deliver a non-delivery report (NDR) to an AMHS user

Enhanced Delivery UA Capability with IHE	
CTUA1602	Deliver an IPM with IHE with the implemented capability of two body-parts

END

APPENDIX B

PROJECT FOR THE OPTIMISATION OF OPMET EXCHANGE, INCLUDING SIGMETs (WS, WV, WC), WARNINGS AND METEOROLOGICAL ALERTS

SAM Region	PROJECT DESCRIPTION (DP)	DP N° H4	
Programme	Project Title	Start	End
<p>Aeronautical Meteorology</p> <p>(Programme coordinator: Jorge Armoa)</p>	<p><i>Optimisation of OPMET exchange, including, SIGMETs (WS, WV, WC), warnings and meteorological alerts</i></p> <p><i>Project coordinator: Reidy Zambrano (Venezuela)</i></p> <p><i>Experts contributing to the project: Rodrigo Cortes (Argentina)</i> <i>Aníbal Castro Cárdenas (Bolivia)</i> <i>Jimmy Nogueira de Castro (Brazil)</i> <i>Sergio Antonio Alves da Silva (Brazil)</i> <i>Edison Lagos (Ecuador)</i> <i>Celestino Lamboglia (Panama)</i> <i>Jorge Otiniano Rodríguez (Peru)</i> <i>Warsodikromo Truusje Soetinie (Suriname)</i> <i>Fernando Reina (Venezuela);</i> <i>Antonio Espinoza (Venezuela)</i></p>	December 2015	December 2020
Objective	<ul style="list-style-type: none"> - Achieve at least 95% efficiency in the reception of OPMET information at the Brasilia IODB by 31 December 2018. - Achieve at least 95% efficiency in the transmission of OPMET information in XML/GML formats in SAM States by 31 December 2018. 		
Scope	Correct preparation and timely dissemination of OPMET information involves all MET service units [(EMA(s), OMA(s), MWO(s) and OPMET data banks] of all SAM aerodromes listed in the CAR/SAM ANP.		
Metrics	The percentage of OPMET messages received on time at the Brasilia International OPMET data bank (according to Annex 3, Appendix 10, OPMET control considers as messages received those OPMET messages with transit times of 10 minutes) and verification of proper and standard production (quality) of OPMET information at MET services [(EMA(s), OMA(s) and MWO(s))] in standardised format (Annex 3, in Appendices 3, 4, 5 and 6 contains the OPMET message planning tables).		
Strategy	All tasks and previous exchange exercises necessary for the compliance of the objectives will be carried out by experts nominated by SAM States (Points of Contact – POC) and by experts contributing to the project, led by the Project Coordinator and under the supervision of the MET Programme Coordinator through State letters sent by the ICAO Lima Office, by e-mail, and the “GoToMeeting” tool. Upon completion of the tasks, the results will be sent to the MET Programme Coordinator as a final document for submission to, and if necessary approval by, the GREPECAS CRPP through the GREPECAS fast-track procedure. For the purpose of collaborative decision-making, meetings will be held with the areas involved.		

Goals	<p>a) Achieve 85% reception of OPMET data in standardised format in the SAM Region at the Brasilia IODB by 31/12/17; and 95% by 31/10/18;</p> <p>b) Achieve 70% reception of OPMET data in XML/GML format in the SAM Region at the Brasilia IODB by 31/10/18;</p> <p>c) Achieve 85% reception of OPMET data in standardised format among SAM States by 31/12/17; and 95% by 31/10/18;</p> <p>d) Achieve 30% reception of OPMET data in XML/GML format among SAM States by 31/12/17; and 70% by 31/12/18</p>
Rationale	More timely meteorological information will optimise flight path planning and prediction, thus improving ATM system safety and efficiency, pursuant to GREPECAS Conclusion 12/64 (CAR/SAM OPMET EXCHANGE CONTROLS). Meteorological information will also minimise the environmental impact of air traffic.
Related projects	<ul style="list-style-type: none"> ➤ Automation ➤ Implementation of ATFM ➤ Implementation of the MET information quality management system (QMS/MET) ➤ Enhanced ATM situational awareness

Project deliverables	Relationship with the PFF of the SAM PBIP ¹	Responsible party	Status of Implementation ²	Date of delivery	Comments
OPMET guide revised and updated	SAM PFF MET 02	MET programme coordinator and project coordinator		March 2018	The OPMET guide prepared by the SAM Office will include procedures for preparing OPMET data and tables with the AFTN/AMHS addresses to which States must send OPMET information worldwide in accordance with the CAR/SAM FASID, thus facilitating the preparation and issuance of MET messages
Controls of efficiency and quality of OPMET information available in the Brasilia International OPMET Databank	SAM PFF MET 02	Brasilia International OPMET Databank		March, June, August, November 2016, 2017, 2018 October 2018	Measurement of the time of reception of OPMET information by the Brasilia International OPMET Databank will be carried out every three months during the duration of the project.
Results of the analysis of coordinated controls of information exchange	SAM PFF MET 02	MET programme coordinator and project coordinator		April, July, October and December 2016, 2017 and 2018	The results obtained from coordinated controls of OPMET information exchange will allow SAM States, as necessary, to implement corrective actions to comply with the goals scheduled for the sake of continuous improvement.
OPMET information exchange tests in XML/GML format	SAM PFF	States in technical		November 2017	The OPMET information exchange tests will be carried out initially with the States that are in a

Project deliverables	Relationship with the PFF of the SAM PBIP ¹	Responsible party	Status of Implementation ²	Date of delivery	Comments
	MET 02	capacity of conducting the test		March 2018 October 2018	position of doing so, at least twice a year.
Results of the Analysis of the OPMET exchange tests in XML/GML format	SAM PFF MET 02	MET programme coordinator and project coordinator		December 2017 December 2018	The results obtained with the biannual OPMET information exchange controls will allow SAM States, as necessary, to implement corrective actions to comply with the goals scheduled for the sake of continuous improvement
Plan for IWXXM implementation				March 2018	
Final project report	SAM PFF MET 02	MET programme coordinator and project coordinator		March 2021	The purpose of the final project report to be submitted by the programme coordinator is to enable the Lima SAM Office to check the achievements of the project and propose to the States future measures to maintain the level attained through OPMET controls.
Resources needed	Funds for meetings with project members in order to assess the results and propose corrective actions. States could use their human resources to conduct the foreseen OPMET tests and controls, and, if necessary, cover the financial costs, since the experience gained will result in an improvement of their own systems. Likewise, participants must be given facilities to participate in GoToMeetings.				

¹ Air navigation system Performance-Based Implementation Plan for the SAM Region

² *Grey* Task not started yet
Green Activity being implemented as scheduled
Yellow Activity started with some delay, but will be implemented on time
Red Activity not implemented on time; mitigation measures are required

SAM COM/MET 2019 Apéndice B al Informe sobre la Cuestión 2 del
Orden del Día

2B-1

```

<?xml version="1.0" encoding="UTF-8"?>
<wfs:FeatureCollection xmlns:wfs="http://www.opengis.net/wfs/2.0"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:metgate="http://metgate"
xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
numberMatched="1" numberReturned="1"
timeStamp="2016-05-25T13:57:02.150Z"
xsi:schemaLocation="http://www.opengis.net/gml/3.2
http://schemas.opengis.net/gml/3.2.1/gml.xsd
http://www.opengis.net/wfs/2.0
http://schemas.opengis.net/wfs/2.0/wfs.xsd http://metgate
http://tiberius.meteo.fr:80/geoserver/wfs?service=WFS&version=2.
0.0&request=DescribeFeatureType&typeName=metgate%3Ametariwxx
m"><wfs:member><metgate:metariwxxm
gml:id="metariwxxm.200"><metgate:data><!--
METAR LFPG 251200Z VRB03KT 9999 -RA SCT012 BKN084 18/15 Q1002 NOSIG
--><iwxxm:METAR xmlns:iwxxm="http://icao.int/iwxxm/1.0"
xmlns:om="http://www.opengis.net/om/2.0"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:metce="http://def.wmo.int/metce/2013"
xmlns:sams="http://www.opengis.net/samplingSpatial/2.0"
xmlns:sam="http://www.opengis.net/sampling/2.0"
xmlns:saf="http://icao.int/saf/1.0"
gml:id="metar-LIMC-20160307T155000Z" status="NORMAL"
automatedStation="false"
xsi:schemaLocation="http://icao.int/iwxxm/1.0
http://schemas.wmo.int/iwxxm/1.0/iwxxm.xsd
http://def.wmo.int/metce/2013
http://schemas.wmo.int/metce/1.0/metce.xsd">
  <iwxxm:observation>
    <om:OM_Observation gml:id="obs-LFPG-20160511T123000Z">
      <om:type
xlink:href="http://codes.wmo.int/49-2/observation-type/IWXXM/1.0/Met
eorologicalAerodromeObservation"/>
      <om:phenomenonTime>
        <gml:TimeInstant gml:id="ti-20160511T123000Z">
          <gml:timePosition>2016-05-25T12:00:00Z</gml:timePosition>
        </gml:TimeInstant>
      </om:phenomenonTime>
      <om:resultTime xlink:href="#ti-20160511T123000Z"/>
      <om:procedure>
        <metce:Process gml:id="p-49-2-metar">
          <gml:description>WMO No. 49 Volume 2 Meteorological
Service for International Air Navigation APPENDIX 3 TECHNICAL
SPECIFICATIONS RELATED TO METEOROLOGICAL OBSERVATIONS AND
REPORTS</gml:description>

```

```

    </metce:Process>
  </om:procedure>
  <om:observedProperty
xlink:href="http://codes.wmo.int/49-2/observable-property/MeteorologicalAerodromeObservation" xlink:title="Observed properties for Meteorological Aerodrome Observation Reports (METAR and SPECI)"/>
  <om:featureOfInterest>
    <sams:SF_SpatialSamplingFeature gml:id="sp-LFPG">
      <sam:type
xlink:href="http://www.opengis.net/def/samplingFeatureType/OGC-OM/2.0/SF_SamplingPoint"/>
      <sam:sampledFeature>
        <saf:Aerodrome gml:id="uuid.LFPG-111230Z-1">
          <gml:identifier
codeSpace="urn:uuid:">LFPG-111230Z-1</gml:identifier>
          <gml:name>CHARLES DE GAULL</gml:name>
          <saf:designator>07157</saf:designator>

<saf:locationIndicatorICAO>LFPG</saf:locationIndicatorICAO>
      <saf:ARP>
        <gml:Point gml:id="ref-point-LFPG" uomLabels="deg deg m" axisLabels="Lat Lon Altitude" srsDimension="3" srsName="http://www.opengis.net/def/crs/EPSSG/0/4979">
          <gml:pos>49.016666666666666 2.5166666666666666
109</gml:pos>
        </gml:Point>
      </saf:ARP>
    </saf:Aerodrome>
  </sam:sampledFeature>
  <sams:shape>
    <gml:Point gml:id="obs-point-LFPG" uomLabels="deg deg m" axisLabels="Lat Lon Altitude" srsDimension="3" srsName="http://www.opengis.net/def/crs/EPSSG/0/4979">
      <gml:pos>49.016666666666666 2.5166666666666666
109</gml:pos>
    </gml:Point>
  </sams:shape>
</sams:SF_SpatialSamplingFeature>
</om:featureOfInterest>
<om:result>
  <iwxxm:MeteorologicalAerodromeObservationRecord
gml:id="observation-record-LFPG-20160511T123000Z"
cloudAndVisibilityOK="false">
    <iwxxm:airTemperature uom="Cel">18</iwxxm:airTemperature>
    <iwxxm:dewpointTemperature
uom="Cel">15</iwxxm:dewpointTemperature>
    <iwxxm:qnh uom="hPa">1002</iwxxm:qnh>
    <iwxxm:surfaceWind>
      <iwxxm:AerodromeSurfaceWind variableDirection="true">
        <iwxxm:meanWindSpeed uom="kn">3</iwxxm:meanWindSpeed>
      </iwxxm:AerodromeSurfaceWind>
    </iwxxm:surfaceWind>

```

```

    <iwxxm:visibility>
      <iwxxm:AerodromeHorizontalVisibility>
        <iwxxm:prevailingVisibility
          uom="km">10</iwxxm:prevailingVisibility>
        </iwxxm:AerodromeHorizontalVisibility>
      </iwxxm:visibility>
    <iwxxm:prevailingVisibilityOperator>ABOVE</iwxxm:prevailingVisibilityOperator>
    </iwxxm:AerodromeHorizontalVisibility>
  </iwxxm:visibility>
  <iwxxm:presentWeather
    xlink:href="http://codes.wmo.int/306/4678/-RA" xlink:title="Light
    precipitation of rain"/>
  <iwxxm:cloud>
    <iwxxm:AerodromeObservedClouds>
      <iwxxm:layer>
        <iwxxm:CloudLayer>
          <iwxxm:amount
            xlink:href="http://codes.wmo.int/bufr4/codeflag/0-20-008/2"
            xlink:title="Scattered"/>
          <iwxxm:base uom="ft">1200</iwxxm:base>
        </iwxxm:CloudLayer>
      </iwxxm:layer>
      <iwxxm:layer>
        <iwxxm:CloudLayer>
          <iwxxm:amount
            xlink:href="http://codes.wmo.int/bufr4/codeflag/0-20-008/3"
            xlink:title="Broken"/>
          <iwxxm:base uom="ft">8400</iwxxm:base>
        </iwxxm:CloudLayer>
      </iwxxm:layer>
    </iwxxm:AerodromeObservedClouds>
  </iwxxm:cloud>
</iwxxm:MeteorologicalAerodromeObservationRecord>
</om:result>
</om:OM_Observation>
</iwxxm:observation>
</iwxxm:METAR></metgate:data><metgate:mwname>LFPG</metgate:mwname>
<metgate:mwolocation><gml:Point srsName="urn:ogc:def:crs:EPSG::4326"
srsDimension="2"><gml:pos>49.016667
2.533333</gml:pos></gml:Point></metgate:mwolocation><metgate:mwocrea
tiondate>2016-05-25T12:00:00Z</metgate:mwocreationdate><metgate:inse
rtiondate>2016-05-25T12:18:48.261Z</metgate:insertiondate></metgate:
metariwxxm></wfs:member></wfs:FeatureCollection>

```

APENDICE / APPENDIX D

International Civil Aviation Organization

**Concept of Operations for the Transition of OPMET
Data Exchange using IWXXM
(EUR Doc 033)**

First Edition - 2016

*PREPARED BY THE EUROPEAN AND NORTH ATLANTIC OFFICE OF ICAO
EDITION DATE 15/06/2016*

International Civil Aviation Organization
Concept of Operations for the Transition of
OPMET Data Exchange using
IWXXM
(EUR Doc 033)
First Edition - 2016

PREPARED BY THE EUROPEAN AND NORTH ATLANTIC OFFICE OF ICAO

EDITION DATE 15/06/2016

International Civil Aviation Organization



Concept of Operations for the Transition of OPMET Data Exchange using IWXXM (EUR Doc 033)

First Edition - 2016

PREPARED BY THE EUROPEAN AND NORTH ATLANTIC OFFICE OF ICAO

EDITION DATE 15/06/2016

TABLE of CONTENT

TABLE of CONTENT	2
1 Introduction	3
2 Scope and Goals	3
3 Assumptions	4
3.1 Managing the transition	4
3.2 Variances to the IWXXM Model	4
3.3 Translation	4
3.4 Data collection	5
3.5 Transmission & Routing	5
3.6 Compliance Testing	5
3.7 Databank	5
3.8 Aeronautical Information Metadata	6
4 Framework	7
4.1 Functionalities definitions	8
4.1.1 Data Producer/Originating Unit	8
4.1.2 International Data Aggregator	8
4.1.3 International functions for Data Translation Centre	10
4.1.4 Data Switch	11
4.1.5 Databank	12
4.2 Regional Centres Definitions	15
4.2.1 National OPMET Centre (NOC)	15
4.2.2 Regional OPMET Centre (ROC)	15
4.2.3 Interregional OPMET Gateway (IROG)	15
4.2.4 Regional OPMET Databank (RODB)	15
5 Transition	17
5.1 Phase 1 Pre-Requisites to Transition – until Nov 2016	17
5.2 Phase 2 From Nov 2016 until Amendment 78 applicability date – 2018	19
5.3 Phase 3 After Amendment 78 applicability date – 2018	21
6 Glossary	22

1 Introduction

The bilateral exchange of IWXXM (ICAO Meteorological Information Exchange Model) based information is introduced in amendment 76 to ICAO Annex 3 (Meteorological Service for International Air Navigation) from November 2013, enabling States to exchange their OPMET data not only in TAC (Traditional Alphanumeric Code form) but also in XML (Extensible Mark-up Language). This represents the start of a huge change from the provision and exchange of textual OPMET data towards a digital environment supporting SWIM (System Wide Information Management). Since their inception, OPMET data have been promulgated to end systems and they were initially designed to be human readable, with a requirement to be highly compact because of limitations in bandwidth.

The current use of OPMET in a TAC format presents an obstacle to the digital use of the data as it is not geo-referenced. This makes the handling of global data difficult to use correctly and expensive to maintain, this has been exemplified in significant difficulties during code changes. The current coding practices also present an obstacle to efficient automation as State coding exceptions are quite commonly used.

IWXXM represents the first step to move to an environment where the systems handling this data can make more use of standard applications and techniques. The development of new systems which provide and support digital OPMET will require initial investment but the use of enabling data exchange standards for other domains such as AIXM (Aeronautical Information Exchange Model) and FIXM (Flight Information eXchange Model) along with IWXXM will lead to cost reduction due to the implementation of widely used data modelling techniques including OGC (Open Geospatial Consortium) segments. Consequently, users will be presented with opportunities to create new products at lower cost by fusing this data.

It is essential that the transition towards the use of IWXXM is adequately planned and equipped to make reliable data sets available to users for exploitation as soon as possible at a Regional - and Global - scale. This Concept of Operation provides elements and steps for consideration in achieving that aim by defining common definitions, concepts as well as structured phases to be implemented in relation to the International exchange of OPMET data.

2 Scope and Goals

This documents main intention is to describe the activities relating to the transition of intra- and inter-regional OPMET data exchange in the 2016 to 2018 timeframe mainly. During this period, it is anticipated that the amendments to Annex 3 requiring this transition towards XML data exchange will effectively become applicable for the international exchange of OPMET data.

These indicated activities can also be considered in context of the ICAO SWIM-concept (Doc 10039).

- **Amendment 76** enabled the bilateral exchange of XML data for those States in a position to do so.
- The **planned Amendment 77** recommends the international exchange of XML-formatted METAR/SPECI, TAF, AIRMET and SIGMET from November 2016.
- The **planned Amendment 78** will require the international exchange of XML-formatted METAR/SPECI, TAF, AIRMET and SIGMET as a standard (planned 2018).

Note: VAA and TCA are also part of amendments 77 and 78, but they will not be explicitly dealt within this document.

The intention of this Concept of Operation is not to define Net Centric services but to provide guidance for a swift transition to IWXXM implementation as a first step towards SWIM.

3 Assumptions

Assumptions on applicable general principles for the international exchange of OPMET data have been made. Their intention is to support the different identified phases that will lead to a managed pan-European IWXXM based international exchange of METAR/SPECI, TAF, AIRMET and SIGMET by the Amendment 78 to Annex 3 applicability date. This could also support a global implementation of IWXXM exchange by the same date.

These Assumptions are listed below.

3.1 Managing the transition

A group responsible for managing the transition will be identified in EUR and preferably in each ICAO region for the necessary intra- and inter-regional coordination and should be guided by a global ICAO body with the support of WMO. (**Assumption 1**)

It is assumed that different regions will progress at different rates. It is necessary to create a plan that facilitates this different implementation pace. (**Assumption 2**)

Note: Groups such as Data Management Group for EUR & Bulletin Management Group for MID could be the right groups to manage this transition (or equivalent groups in other regions).

3.2 Variances to the IWXXM Model

National Extensions (such as remark sections) will be removed before international distribution by a national Centre. As a direct consequence, the international exchange will only include data fully compliant to the IWXXM model. (**Assumption3**)

Note: "IWXXM model" should here be understood as the XML schema including all necessary GML components (including metadata) necessary for the exchange of IWXXM data

3.3 Translation

In order to minimize as much as possible the translation between formats from the Amendment 77 applicability date until the Amendment 78 applicability date for IWXXM, it is assumed that more and more Originating Units e.g. aerodrome meteorological offices, Met Watch Offices etc. will have IWXXM capability and will produce both TAC and IWXXM formats. Following Annex 3 Amendments 76 and 77 requirements, when a State produces IWXXM data, it will also produce TAC data that will be exchanged internationally in addition to IWXXM data. (**Assumption 4**)

As a consequence of previous *Assumption 4*, there will be no translation/conversion from IWXXM to TAC for international distribution before the Amendment 78 applicability date. (**Assumption 5**)

Where a translation from TAC to IWXXM is necessary and conducted, the translation centre and date/time of when the translation occurred will be identified within the XML message. The translation centre metadata will be defined as part of a globally accepted GML/XML model. (**Assumption 6**)

To avoid transmission of TAC messages translated from IWXXM after the implementation of Amendment 78 to Annex 3, all inter-regional exchange will be carried out using only IWXXM. (**Assumption 7**)

Note: If it happens that TAC exchange is still present and no longer required beyond the Amendment 78 applicability date - at least partly in some regions - this should be organized (by regional agreement) within the region. Such an arrangement might also include XML to TAC translation.

3.4 Data collection

It is assumed that non regular reports (e.g. SIGMET) will NOT be aggregated in the same file. (**Assumption 8**)

When creating a feature collection of the same type of IWXXM data (e.g. METAR) , further named as “bulletin”, the aggregating centre identifier and date/time group of when the collection was created will be indicated within the XML message. The aggregating centre metadata will be defined as part of a globally accepted GML/XML model.

(**Assumption 9**)

A single bulletin will only contain TAC or XML, never both. (**Assumption 10**)

A single File will contain only one bulletin. (**Assumption 11**)

3.5 Transmission & Routing

Given the size and character set of IWXXM messages, it will not be possible for these messages to be transmitted via AFTN. The file containing the bulletin will be compressed and FTBP (**File Transfer Body Part**) under Extended AMHS (**ATS Message Handling System**) will be used to exchange IWXXM data internationally through the AFS. (**Assumption 12**)

The principles of exchanging IWXXM data on AMHS are further described in section 4.1.4 but, in general, rules close to the ones governing the TAC transmission are applied.

The WMO abbreviated header structure (TTAAiiCCCC) will be part of the filename of the File Transfer Body Part and used as data identifier. The routing of IWXXM messages will associate this data identifier with AMHS address(es) that the message should be sent to. (**Assumption 13**)

As a file name extension, the appropriate suffix developed by WMO will be used to identify compressed data using globally agreed compression techniques. (**Assumption 14**)

Note: The number of FTBPs and the maximum message size are subject to the AMHS specifications.

3.6 Compliance Testing

IWXXM compliance testing platforms or software will be made available in order to allow States to test the compliance of their XML data to the IWXXM model before operational international exchange. This is meant to assure that the future internationally disseminated data are operationally usable. (**Assumption 15**)

3.7 Databank

In order to allow IWXXM data retrieval from International Databanks, a standard set of queries for IWXXM data will also need to be developed, agreed and documented. An Interface Control Document will be provided to describe the query structure, structure of the answer(s) and bulletin header(s) to be used by the International

Databank, as well as all other information necessary for the automatic use of the query answers. The proposed query language for IWXXM data will follow similar rules as the TAC-requests (c.f. section 4.1.5).

(Assumption 16)

3.8 Aeronautical Information Metadata

The Aeronautical Information metadata are part of the XML model and should be transported by the IWXXM data. (Assumption 17)

The metadata is additional information relevant to the type of the aeronautical information object i.e. an airport, an FIR. A challenge resides in getting the correct state of this aeronautical information, especially for centres that will perform translation from TAC to XML that will require this. Therefore, obtaining this from an authorized source is implied, in order to provide the right piece of information that characterizes the data (e.g. for a METAR, which airport location indicator and official name, its altitude, longitude, latitude etc ...).

Note: A further step that could be foreseen is a possible indirect link to the AIXM model where the IWXXM data will just reference where to get this aeronautical information metadata from, therefore avoiding possible inconsistencies between the transported metadata inside the IWXXM data and the current status of this aeronautical information as part of the AIXM model.

4 Framework

This section is intended to describe the generalized elements which can be used to establish a framework for the exchange of IWXXM data, both intra-regionally and inter-regionally, with the neighbour regions. One key aspect is, that the framework needs to be flexible to permit development of an intra-regional structure suitable to the requirements, but at the same time allowing establishment of controlled and coordinated exchange between regions.

The framework is organized into a basic set of functions/type of operations as described in section 4.1. A list of requirements that should be met to carry out each respective function as well as illustrations on how these functions may be performed/combined are provided in the same section.

In section 4.2, more complex regional entities which comprise some of the above functions are described.

4.1 Functionalities definitions

4.1.1 Data Producer/Originating Unit

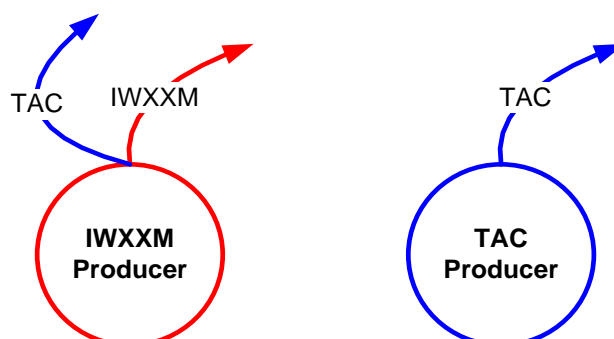
TAC Data Producer

This producer provides TAC data only.

IWXXM Data Producer

In line with the stated assumptions, this producer provides information in both TAC (until no longer requested in Annex3) and IWXXM forms.

The Data Producer-function may be performed by an aeronautical meteorological station (e.g. producing a METAR), a MWO (Meteorological Watch Office) producing AIRMET or SIGMETS or as well by an AMO (Aerodrome Meteorological Office) providing TAFs.



For an IWXXM Producer, the following functions could be the subject to compliance testing:

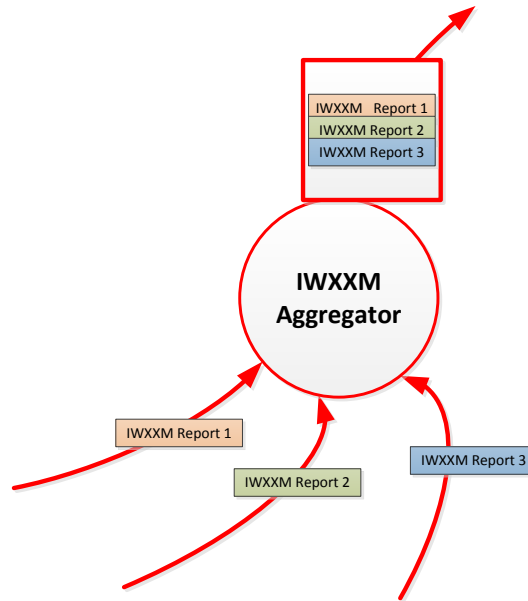
- The Producer output will conform to the IWXXM Schema
- The Producer output will pass IWXXM Schematron/business rules
- The Producer will apply appropriate (defined) metadata following agreed ICAO rules and regulations.

4.1.2 International Data Aggregator

This function takes individual IWXXM reports - decompresses them if already compressed - aggregates them into bulletins and compresses them.

Bulletins shall consist of one or more reports of the same type (e.g. METAR).

When aggregating reports, the Aggregator shall collect and combine them as a bulletin – defined as a Feature collection - in conformance with the globally agreed GML/XML model. In particular, all required metadata information, as defined by the globally accepted GML model, should be indicated.



For an IWXXM Aggregator, the following functions could be the subject of compliance testing.

- The Aggregator output will conform to the IWXXM Schema
- The Aggregator output will pass IWXXM Schematron/business rules
- The Aggregator will apply a correct filename to its output
- The Aggregator correctly compresses data applying an appropriate suffix.
- The Aggregator will apply appropriate (defined) metadata following agreed ICAO rules e.g. for monitoring and validation issues.

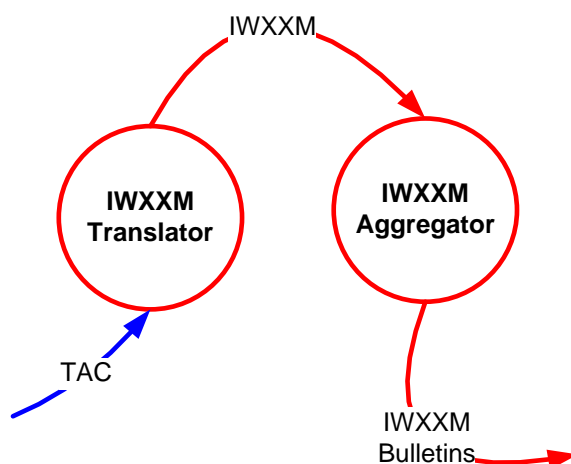
4.1.3 International functions for Data Translation Centre

A data translator converts TAC data into IWXXM on behalf of another State. To do so, it shall be able to parse incoming TACs and apply the data to IWXXM schema.

It is expected that this will be carried out on a bulletin basis so that the translator will always be associated with an aggregator function.

The translator should provide an indication of where and when the translation has been carried out in order to provide traceability. This shall be achieved by introducing agreed metadata elements (centre identifier and time stamp) that shall be defined as part of a globally accepted GML/XML model.

It is highly likely that not all incoming TACs will be translatable because of non-conformance with TAC standards. There will be a need to have procedures in place to deal with these rejected data.



For an IWXXM Translator, the following functions could be the subject of compliance testing.

- The Translator output will conform to the IWXXM Schema
- The Translator output will pass IWXXM Schematron/business rules
- The Translator will successfully translate a standard set of TAC test data
- The Translator provides metadata related to when and where data have been translated - such metadata conforms to the agreed metadata structure.
- The Translator will apply appropriate (defined) metadata following agreed ICAO rules e.g. for monitoring and validation issues.

Note: A Translation centre should also perform Aggregator functions.

4.1.4 Data Switch

A Data Switch will route IWXXM data according to the TTAaiCCCC part of the filename of the File Transfer Body Part. The filename including the current WMO bulletin header will be structured as follows (WMO naming convention A):

A_TTAaiCCCCYGGggBBB_C_CCCC_YYYYMMddhmmss.xml.[compression_suffix],

Where the elements in black and bold are fixed elements and:

TTAAiCCCCYGGgg is the current WMO header with the date time group

BBB is *optional* (as usual),

CCCC is the repeated CCCC part from TTAaiCCCC,

YYYYMMddhmmss is the date/time group

Note: [compression_suffix] will be subject to further acceptance, depending on which compression technique is agreed. Compression software such as zip should be avoided as it may allow transportation of more than one file and directories as well.

The routing table will associate this TTAaiCCCC data identifier with the AMHS addresses where the data should be sent to. The compressed file will be named with the suffix appropriate to the compression and sent onto AMHS.

(Assumption 12)

FTBP name examples with METAR from LFPW:

A_LAFR31LFPW171500_C_LFPW_20151117150010.xml.**[compression_suffix]**

1st retarded bulletin:

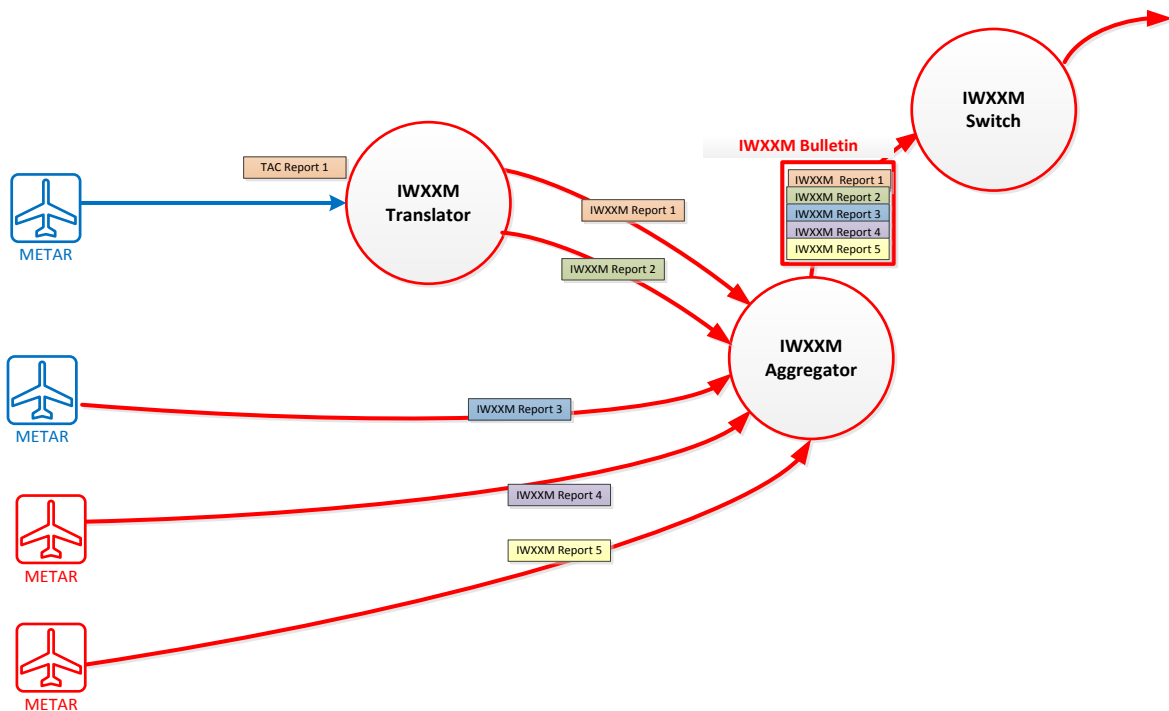
A_LAFR31LFPW171500RRA_C_LFPW_20151117150105.xml.**[compression_suffix]**

1st corrected bulletin:

A_LAFR31LFPW171500CCA_C_LFPW_20151117150425.xml.**[compression_suffix]**

WMO defined T1T2 (from TTAai) for the following data types:

- Aviation Routine Report (*METAR*): *LA*
- Aerodrome Forecast ("*short*" *TAF*) (VT < 12 hours): *LC*
- Special Aviation Weather Reports (*SPECI*): *LP*
- Aviation General Warning (*SIGMET*): *LS*
- Aerodrome Forecast ("*long*" *TAF*) (VT >= 12 hours): *LT*
- Aviation Volcanic Ash Warning (*VA SIGMET*): *LV*
- Aviation Tropical Cyclone Warning (*TC SIGMET*): *LY*



4.1.5 Databank

An International Databank will provide the capability for users to interrogate IWXXM data through the AFS in much the same way as the RODBs currently provide for TAC data.

There will be no TAC to IWXXM translation taking place by the Databank in case the requested OPMET is only available in TAC, as this translation should be done upstream by a Translation Centre.

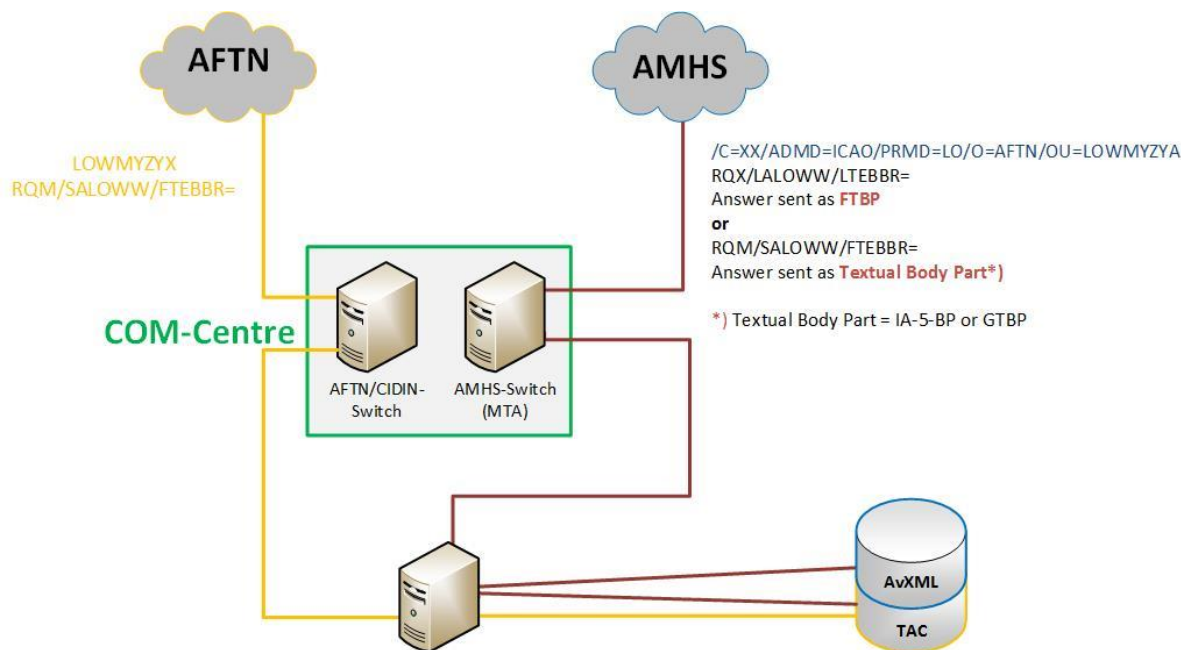
Although the implementation of Net Centric Services is beyond the scope of this CONOPS, the Databank element could as well provide Net Centric services in addition to the AFS based IWXXM interrogation capabilities. As soon as agreed descriptions of the interface to request data via web-services are available, this additional feature may be added for the databank.

For an IWXXM Databank, the following functions could be the subject of compliance testing.

- The Databank output shall conform to the IWXXM Schema
- The Databank output shall pass IWXXM Schematron/business rules
- The Databank has an AMHS interface or is interconnected with a Data switch with an AMHS Gateway
- The Databank shall only send the response back to the originator.
- The Databank shall aggregate the reply reports according to the same rules used by the Data Aggregators
- The Databank shall apply a correct filename to its output
- The Databank base correctly compresses data applying an appropriate suffix.
- The Databank shall respond correctly to the standard interrogations.

Example: the implementation of a combined TAC & IWXXM Databank

The picture below illustrates a possible implementation of a RODB with combined TAC and IWXXM functionalities.



Technical principles:

- Interfaces:
 - o the Databank has an AMHS P3 connection to the AMHS Message Transfer Agent (MTA) of a COM centre
 - o in case the COM Centre still serves AFTN users, the Databank may have a separate AFTN connection to the COM Centres AFTN switch or alternatively, the COM Centre will take care of the AFTN-AMHS conversion
- Databank tables: data in IWXXM and data in TAC are stored in separate sets of tables.

Operational principles:

- DB Requests
 - o Requests for TAC data can be sent via AFTN or via AMHS (Textual Body Part). These requests will continue to work as described in the current RODB Interface Control Documents
 - o Requests for IWXXM data shall be sent via AMHS as Textual Body Part.
 - o Requesting data in IWXXM will work in a similar way as requesting TAC data. The above example uses a syntax similar to the TAC requests, but:
 - "RQX/" is used as the start of the query
 - only the new IWXXM T₁T₂ message types defined by WMO are allowedFor example: RQX/LALOWW/LTEBBR/LSLFFF=
 - o Requests for TAC data and requests for IWXXM data shall not be mixed

- Any violation of the above principles (e.g. the request “RQX/LSLOWW=” received via AFTN), will result in an automatic reply sent by the databank, informing the user that this is not allowed.

- DB Replies

- Replies to TAC requests will continue to work as described in the current RODB Interface Control Documents.
- Reply reports of a IWXXM request will be aggregated into one or more files, according to the same rules used by the Data Aggregators, e.g. no mixing of message types in one file.
- These files will be compressed and a correct file name with appropriate suffix supplied.
- These files will be sent as FTBP through AMHS.
- The RODB Interface Control Documents will specify an extended set of standardized information & error replies.

4.2 Regional Centres Definitions

4.2.1 National OPMET Centre (NOC)

The role of the NOC is to collect and validate all FASID required OPMET messages generated by all originating units within a State, to compile national data into bulletins and to distribute them internationally according to the regional distribution schema.

Note: It is assumed that the data provided by NOCs is in accordance with the similar specifications as applicable for an International Data Aggregator

4.2.2 Regional OPMET Centre (ROC)

Within the EUR-region, there are three ROCs: London, Toulouse and Vienna.

A ROC is responsible for the collection from NOCs and validation of all FASID required OPMET data in its Area of Responsibility (AoR) according to the regional distribution schema.

Each ROC is responsible for the collection of required OPMET data from the other ROC(s) in the region and the dissemination to the other ROCs of the required data from its AoR.

For IWXXM exchange, a ROC should perform the following functions:

- Data Aggregator
- Data Translation centre
- Data Switch

4.2.3 Interregional OPMET Gateway (IROG)

Within the EUR-region, there are three IROGs: London, Toulouse and Vienna.

An IROG is responsible for the collection of all required OPMET data from its Interregional Area(s) of Responsibility (IAoR) and its dissemination to the ROCs in its region.

Furthermore, the IROGs are responsible for collection and dissemination of their region's required OPMET data to their partner IROGs.

The IROG is responsible for the validation of the bulletins sent to the IROGs of its IAoR and received from their IAoR.

For IWXXM exchange, an IROG should perform the following functions:

- Data Aggregator
- Data Translation Centre
- Data Switch

4.2.4 Regional OPMET Databank (RODB)

Within the EUR-region, there are three RODBs: Brussels, Toulouse and Vienna.

The Regional OPMET Databank(s) (RODB) are supplied with required OPMET data by the ROCs. These databases can be queried via the AFS by using a specified query language.

Details on the query language as well as the supported data types can be found in EUR Doc 018, Appendix A (EUR Regional Interface Control Document for OPMET Database Access Procedures). Those documents will be updated to integrate the new functions.

An RODB shall be able to fulfil the requirements to handle IWXXM-code as described in paragraph [4.1.5](#).

5 Transition

The first necessary step is to define the prerequisites in order to be able to exchange IWXXM OPMET data. This will impact not only the network itself, but also the Message Switching Systems and most of the end-user systems.

5.1 Phase 1 Pre-Requisites to Transition – until Nov 2016

Governance

EUR regional group to manage the transition

Regional group(s) should be designated to deal with the transition in order to further define and monitor:

- Intra-regional plan on AMHS infrastructure/links planning and IWXXM data exchange between the three ROCs, and between ROC and RODB
- Intra-regional implementation plan on IWXXM data exchange planning by the States to their ROC
- Agreement to define how testing platform and software should be made available and accessible for every State should be reached.

Regional group(s) in other ICAO regions

It is desirable that responsible group(s) for managing the transition in other ICAO regions be established, that could be responsible for defining the Regions structure and capabilities in the context of the framework.

Furthermore a full liaison should be established and maintained between the ICAO groups in charge of meteorology & data exchange and groups in charge of the AFS network.

For data translation purposes, if there is a systematic need for the translation of data on behalf of a State, this may be performed by the dedicated ROC for the part of the region under its Area of Responsibility and the IROGs for the interregional distribution.

Documentation

The region will define and have a plan in place to provide IWXXM data. This plan shall be published and maintained by the designated responsible groups (FAQ's etc. should be available).

ICAO and WMO documentation and provisions should be published/available describing the IWXXM code itself as well as documentation referencing the appropriate schemas and rules made available in order to handle this new format.

Facilities

An agreed process should be defined to ensure that data generated by Data Producers are compliant – in particular, no extension will be published internationally. In order to promote the use of IWXXM, the process should be widely known and shared and some tools to check the compliance state of the data easily accessible and usable.

An identical process should be agreed to initiate and enable the IWXXM exchange between regions.

An AMHS network will be available to support exchange IWXXM data by the use of FTBP for between those States wishing to do so. Corresponding AMHS connections will be available between those regions exchanging IWXXM data.

Phase 1 is enabled by amendment 76 from November 2013.

To achieve an efficient transition towards IWXXM, Phase 1 activities should be focused in the following areas and the particular elements identified per area:

Cyber Security

- appropriate AFS security elements should be defined by the ICAO groups in charge of information management / networks in order to introduce the operational exchange of IWXXM data via AMHS.

Source of Metadata

- Update process or notification on modifications about Aeronautical information metadata by the States should be in place at the end of the period or metadata sources should be defined and agreed.

Wrong/inadequate policy in TAC coding/ appropriate action plan to reduce rejections

- Actions plans based on monitoring results about TAC data not following the agreed coding rules could be undertaken in order to assist States in detecting and correcting wrong coding policies.
- A task should be started to define a procedure that the ROC may use on how to deal with errors in IWXXM-messages, in particular taking into account errors detected in converting TAC-reports. This procedure – ideally
 - would provide clear description on how to report errors to a State that provides these data and clearly define this service and its limitation.

Inter-regional (I/R) cooperation/coordination

The following tasks should be started:

- The update process and notification on modifications on IWXXM bulletins headers between the EUR and the adjacent regions.
- Identification of the I/R exchanges solely based on required FASID data: actions plans to define clearly the I/R data/bulletins to be exchanged.
- I/R plan to follow the AMHS infrastructure/links planning between AFS nodes supporting I/R data exchange of neighbouring IROGs.
- Implementation plan for I/R exchange between IROGs.
- An update process to introduce IWXXM in the contingency plans for the IROGs.

5.2 Phase 2 From Nov 2016 until Amendment 78 applicability date – 2018

The following elements should be ready:

Operations

- The three EUR ROCs & IROGs should have the capability to act as translation centres, to aggregate and switch IWXXM data.
- NOC: the NOC should prepare the transition to be ready to exchange IWXXM data at the end of the period.
- The three EUR RODBs should have all the capabilities to deal with IWXXM data as well as TAC data.
- Update process or notification on modifications about metadata should be in place not later than the end of the period
- The standard set of queries for IWXXM data for a RODB should be implemented and documented.
- Update process and notification on modifications on IWXXM bulletins headers between the EUR and the adjacent regions should be in place and tested – at least for the regions ready to exchange IWXXM data with the EUR IROGs.

Note: if it happens that some delays occur in having the IWXXM model including metadata structure and agreement in FTBP use available, it is assumed that the operations in exchanging IWXXM data will be delayed and probably not be ready at the start of the period.

Institutional issues and Technical issues

- Some communication events should be organised to inform States and users - both on ICAO and WMO side
- about the IWXXM code, the metadata use, and the new procedures to access the RODBs.
- The IWXXM model should integrate the metadata related to Data Aggregator and Data Translator functions.
- A procedure used by the ROC should be in place on how to deal with errors in IWXXM-messages, in particular taking into account errors detected when converting TAC-reports. This procedure includes items on how to report errors to a State that provides these data.

Wrong/inadequate policy in TAC coding/ appropriate action plan to reduce rejections

- Action plans based on monitoring results about TAC data not following the agreed coding rules should be in place in order to assist States in detecting and correcting wrong coding policies.
- A procedure that the ROC can use on how to deal with errors in IWXXM-messages, in particular taking into account errors detected in converting TAC-reports, should be agreed on and made available. This procedure – ideally - provides as well elements on how to report errors to a State that provides these data and clearly define this service and its limitation.

Regional Coordination/planning

- The regional group(s) designated to deal with the transition should define and monitor:
 - Intra-regional plan about AMHS infrastructure/links planning and IWXXM data exchange between the three ROCs, and between ROC and RODB.

- Intra-regional plan about the IWXXM data exchange planning by the States to their ROC.
- The Contingency plans for the ROCs should integrate the IWXXM data and be ready before the end of the period.
- Testing platform and software are made available and accessible for every State.

Inter-regional (I/R) cooperation/coordination

- The necessary actions to restrict the I/R data/bulletins to be exchanged to the required FASID data should be undertaken, so that, at the end of the period, no more IWXXM non FASID data are exchanged inter-regionally.
- The I/R mechanism to follow the AMHS infrastructure/links planning between AFS nodes supporting I/R data exchange of IROGs should be in place and so should the I/R procedure to notify the changes and new IWXXM bulletins introduction.
- The Contingency plans for the IROGs should integrate the IWXXM data and be ready at the end of the period
- It is proposed that bilateral agreements between IROGs are set up for the translation of TAC data from Region 1 into IWXXM data for EUR. This agreement should include notification process on IWXXM data newly produced by Region 1.

Figure 1 below provides an example of the EUR Region interfacing with 2 other Regions.

In this example, it is assumed that:

- There is no operational exchange of IWXXM data between Region 1 and EUR.
- There is operational exchange of IWXXM data between Region 2 and EUR.

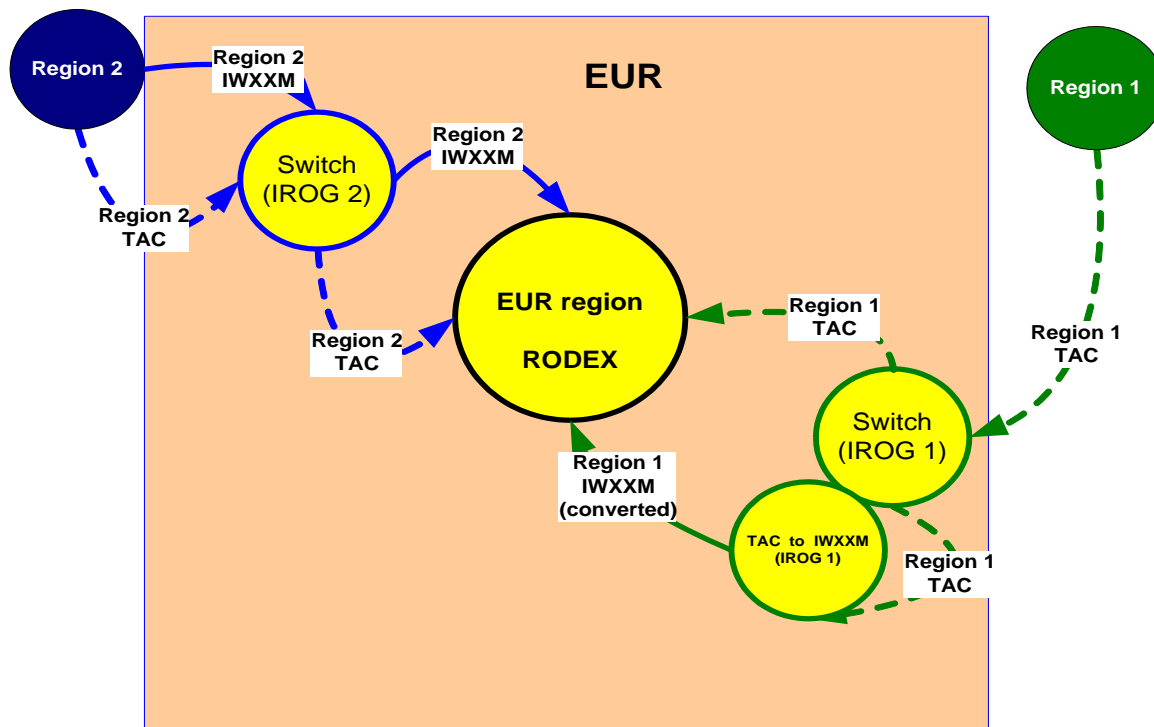


Figure 1: Phase 2, I/R exchange with Region1 (not IWXXM capable) and Region 2 (IWXXM capable)

5.3 Phase 3 After Amendment 78 applicability date – 2018

TBD

6 Glossary

AFS	Aeronautical fixed service
AFTN	Aeronautical fixed telecommunication network
AIXM	Aeronautical Information Exchange Model
AMD	Amendment
AMHS	ATS Message Handling System
AMO	Aerodrome Meteorological Office
AoR	Area of responsibility
COM	Communication
CONOPS	Concept of operations
DB	Databank
FAQ	Frequently asked questions
FASID	Facilities and services implementation document
FIR	Flight information region
FIXM	Flight Information exchange Model
FTBP	File Transfer Body Parts
GML	Geography markup language
I/R	Inter regional
IA-5	International Alphabet nr. 5
IAoR	Interregional area of responsibility
ICAO	International Civil Aviation Organization
ICD	Interface control document
IROG	Interregional OPMET Gateway
IWXXM	ICAO Meteorological Information Exchange Model
METAR	Meteorological Aerodrome Report
MTA	Message transfer agent
NOC	National OPMET Centre
OGC	Open Geospatial Consortium
OPMET	Operational Meteorological information
ROC	Regional OPMET Centre
RODB	Regional OPMET Databank
RODEX	Regional OPMET Data Exchange model
RQM	Meteorological databank request in TAC-format
RQX	Meteorological databank request in IWXXM-format
SIGMET	Significant Meteorological Information
SPECI	Special meteorological report
SWIM	System Wide Information Management
TAC	Traditional Alphanumeric Code form
TAF	Aerodrome forecast
TCA	Tropical Cyclone Advisory
VAA	Volcanic Ash Advisory
XML	Extensible Markup Language